

ILLUSTRATED HANDBOOK.

AQUARIUM, PICTURE SALON, CYCLORAMA, MUSEUM, AND TECHNOLOGICAL COLLECTIONS.

UNDER THE CONTROL OF

THE EXHIBITION TRUSTEES:

HON. L. L. SMITH, L.S.A., F.R.G.S., ENG., F.S.A., *Chairman.*

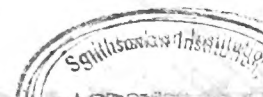
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SIR MALCOLM D. McEACHARN, THE
RIGHT WORSHIPFUL THE MAYOR OF
MELBOURNE.

COMPILED BY JAMES E. SHERRARD,
Secretary, Exhibition Trustees.

Melbourne:

BY AUTHORITY: ROBT S. BRAIN, GOVERNMENT PRINTER.



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Div. Fishes. Carded

Division of Fishes
U. S. National Museum

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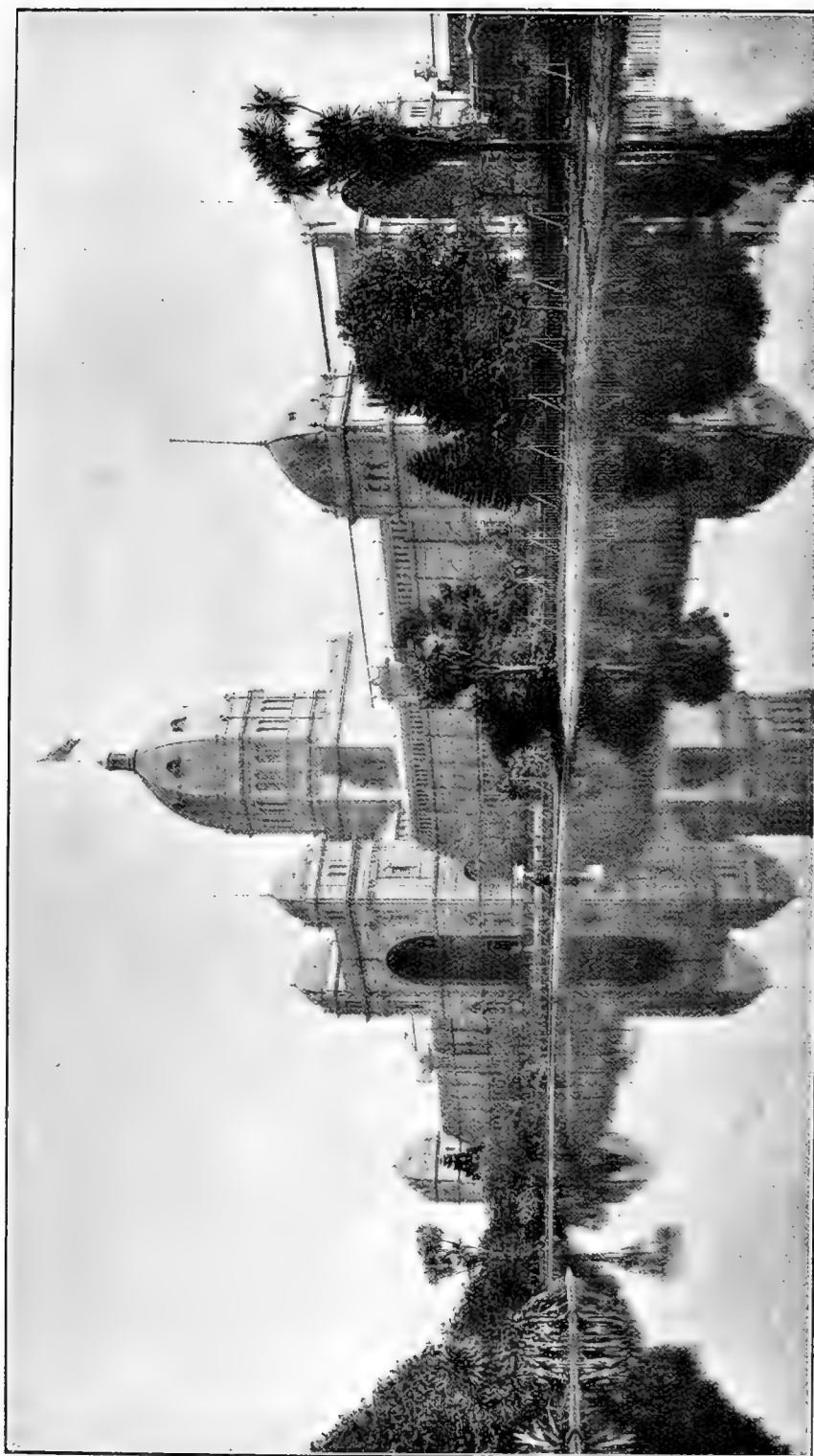
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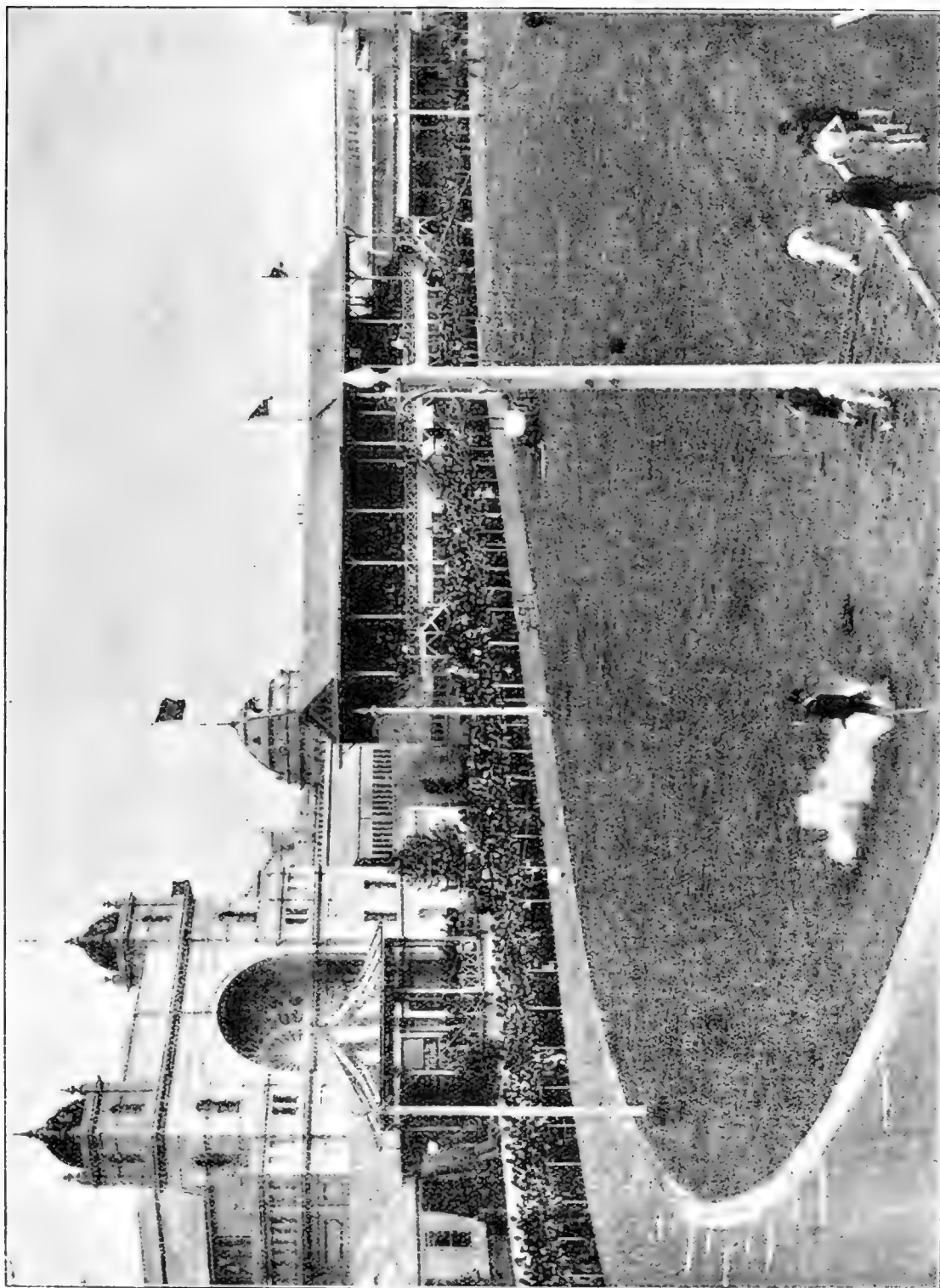
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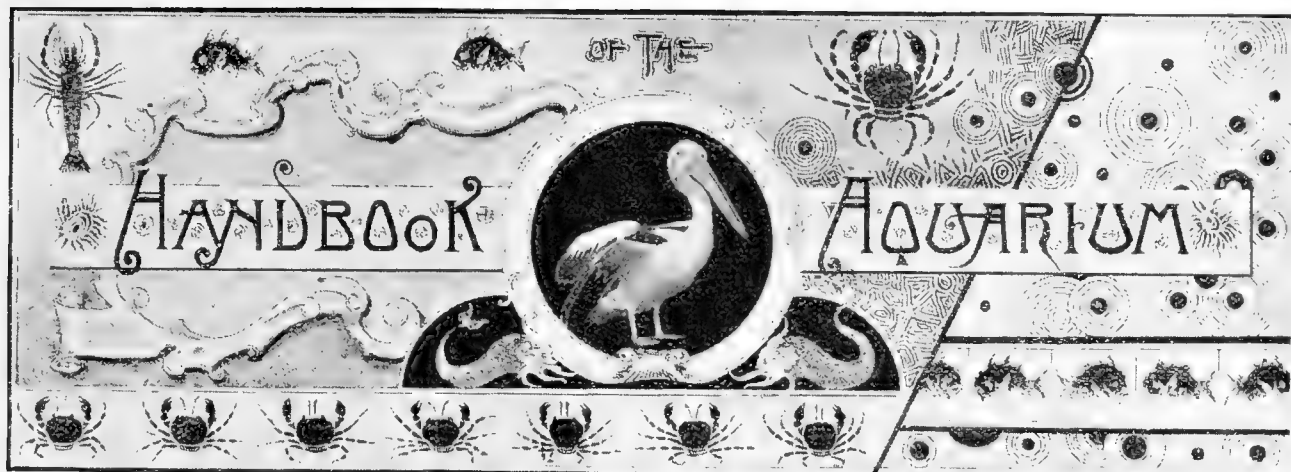
THE EXHIBITION SPORTS OVAL ON A GALA DAY.

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INTRODUCTORY.

THE EXHIBITION AQUARIUM is an institution of quite recent growth, as its construction was not commenced till 1884, when several small experiments were made as to the practicability of establishing a salt-water Aquarium at such a distance from the coast. These experiments were successful, and the Trustees of the Exhibition Building considered themselves amply justified in proceeding with the preliminary works, which have been added to from time to time until the present result has been obtained.

A great deal of the success of the Aquarium has depended on the personal interest which has been taken in it by the Trustees, who have, individually and collectively, given a vast amount of time and attention to further its advancement and render the various arrangements perfect.

Exhaustive inquiries were made from the managers of the various Aquaria in Europe, and a quantity of information was received which proved of the utmost use in establishing the various departments of the Aquarium.



THE PICTURE SALON,

Correspondence was opened with the managers of the various Aquaria in Europe, and the Trustees desire to express their grateful thanks for the information so freely given on all points. At the initiation of the enterprise many difficulties were encountered, and unforeseen obstacles had to be overcome before the final successful result was attained.



THE EASTERN GARDENS.

The Melbourne Exhibition Aquarium has the honour of being the first established in Australia, but our neighbours in Sydney were not slow to follow the example given, and Aquaria have also been built at Bondi and Coogee.

This establishment of Aquaria is an evidence of the progression of education which is taking place in every department of economic production, and there is little doubt that the experiments which will be conducted from time to time in this Aquarium will be exceedingly useful, and, it is hoped, will lead to a further development of the fishing industries of the colony.

In compiling this work for the convenience of visitors to the Aquarium, an endeavour has been made to give the greatest possible amount of information about the fish of Victoria generally, which may, perhaps, be found interesting to the general public. Of course, every kind of fish which is mentioned in the book is not to be seen in the tanks; the difficulties attending the capture of some of the rarer kinds being enormous, and, when they are taken, there is the attendant risk of transit from the shore to the Aquarium.

It must be borne in mind also that only certain classes of fish, namely, those that are of what might be termed a "domestic" turn of mind, are suitable for captivity; the swift-swimming migratory fishes of the ocean do not stand incarceration well, so that most of the specimens are those which are found in close proximity to our coasts.

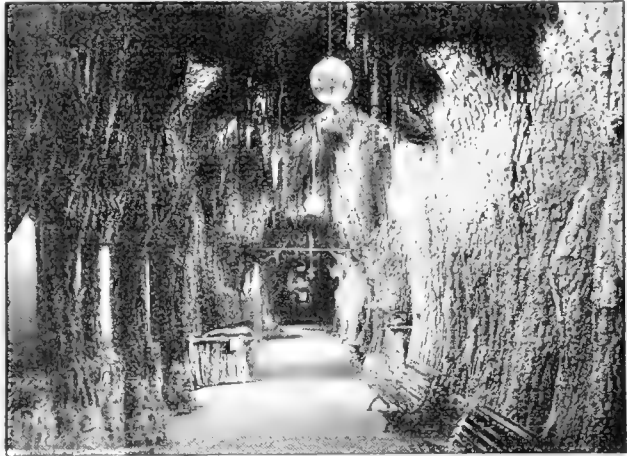
THE AQUARIUM

Was commenced in 1884, and was opened in 1885. Since then additions and alterations have constantly been made until it has been brought into its present state of perfection. The difficulties attending the construction and carrying on of such an establishment in the first

instance can only be imagined by one who has gone through the ordeal, as everything at first seems to combine for the mortification and disappointment of the manager. As a matter of fact, the public have very little idea of the difficulties to be overcome. Nearly every one knows that fish are most delicate creatures, and very soon expire on being removed from their native element. Here they live in an imitation sea, and all the conditions are artificial.

It is evident that it is only by close observation of the conditions observable in creation that man can artificially keep such delicate creatures as the inhabitants of the ocean are in captivity, without simulating as much as possible by scientific means the conditions imposed by nature on all its creatures.

Water when stagnant contains no atmospheric air for living creatures to respire, the tiny pools left in the hollows of the rocks by the ebbing tide and into which all of us have gazed with wonder and delight at the mimic forests of seaweed and coral, blending in harmony with beautiful colour and exquisite form with the stolid crustaceans, wandering like the ghosts of departed heroes through ancestral



CORRIDOR OF AQUARIUM.



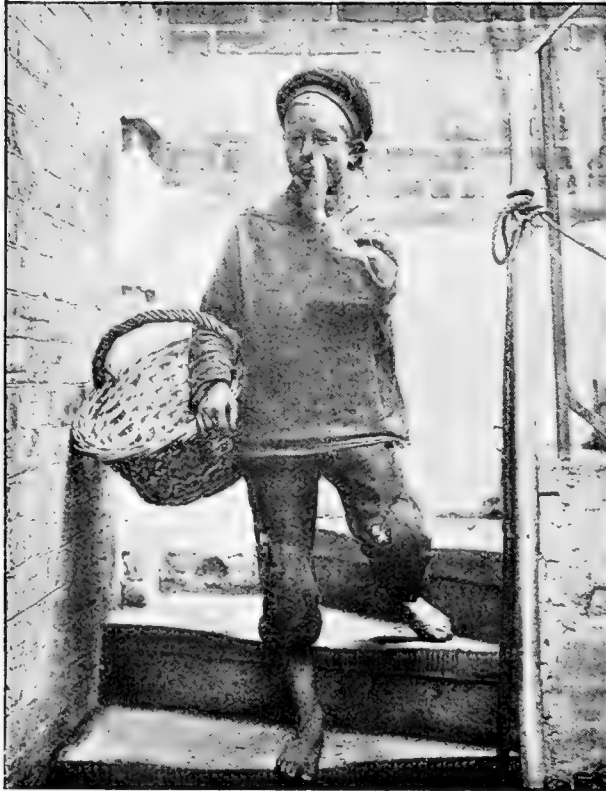
HAULING ON SOUTH MELBOURNE BEACH.—FROM A PICTURE BY VICTOR HENRY.

halls, with members of the finny tribe darting from point to point, must have wondered at and admired the all-powerful laws of nature; for were it not that the water were duly refreshed at the appointed time by the incoming tide, the bright clear crystal water would lose its brilliancy, the colours of the vegetation would fade, the living creatures perish one by one, and

what was an object of beauty and admiration would become in a few short hours loathsome and foul. The same effect would occur, on a larger scale, in the ocean itself, were it not for the storms and tempests that cause the surface of the sea to be dashed into waves and billows and sweetened and revived by the life-giving oxygen of the atmosphere.

THE TANKS.

The two tanks which are situated in the eastern corridor are constructed of Castlemaine slate slabs—a material, however, which has not been found suitable, as the chemical action of the sea-water after a time causes exfoliations and consequent leaks—and it has been found



necessary to have these tanks faced with bricks. The slate is, however, excellently adapted for smaller tanks (such as those which are found in the entrance vestibule, between which and the Fernery may be seen a tank entirely constructed of iron and glass, the bottom being plate iron, riveted together, the pillars of T iron being covered by cast-iron columns). The 60-ft. tank in the further corridor is also constructed of iron, but on a different principle, the bottom consisting of cast-iron plates, riveted together. The glass is best plate, $1\frac{1}{4}$ inches thick, and is fixed in place with a mixture of red and white lead, with the addition of a little oil or Russian tallow, to prevent it setting too hard.

The lighting of the tanks is all done from above, and a certain degree of sombreness is maintained in the corridors in order to allow of the habits of the denizens of the tanks being properly observed. The space where the spectators stand is opaque to the fishes themselves, as can be easily demonstrated by passing the hand close to the glass, when it will be seen that no notice is taken by the movement, even though the eye of the fish be within a few inches; but the slightest sound of a tap on the glass by a finger obtains instant attention. A curious effect can also be observed by glancing at the upper

surface of the water, which, acting by refraction, gives a mirrored representation of the interior of the tank and its contents.

THE WATER.

The water which is used in the tanks is, in the first instance, obtained from the Bay, and pumped into 400-gallon tanks on carts, and then allowed to run into three underground reservoirs containing in the aggregate over 100,000 gallons; thence it is pumped into the tanks and allowed to return to the reservoirs. At the first inception of the Aquarium there was a great difficulty in getting the water free from turbidity, and it was some considerable time before experience taught that the cause was insufficient circulation and aeration, together with an excess of light; rays of the sun with their all-vivifying power start into life countless millions of infusorial spores which cause the water to assume the appearance which is technically known as "pea soupy," and it becomes necessary to run the water off into one of the underground reservoir tanks, where in utter darkness the microscopic growths cease to exist and in three or

four days the water has regained its normal clearness. As will be readily understood, the management of an Aquarium is a much easier matter when adjacent to the sea-coast where a constant supply of salt water can be obtained when required, as there is no doubt that no matter how perfectly matters are arranged the daily supply must be beneficial; however, in our case this is impossible. So the nearest approach to the economy of a miniature sea is aimed at by the use of the underground reservoirs and the circulation and aeration of the water.

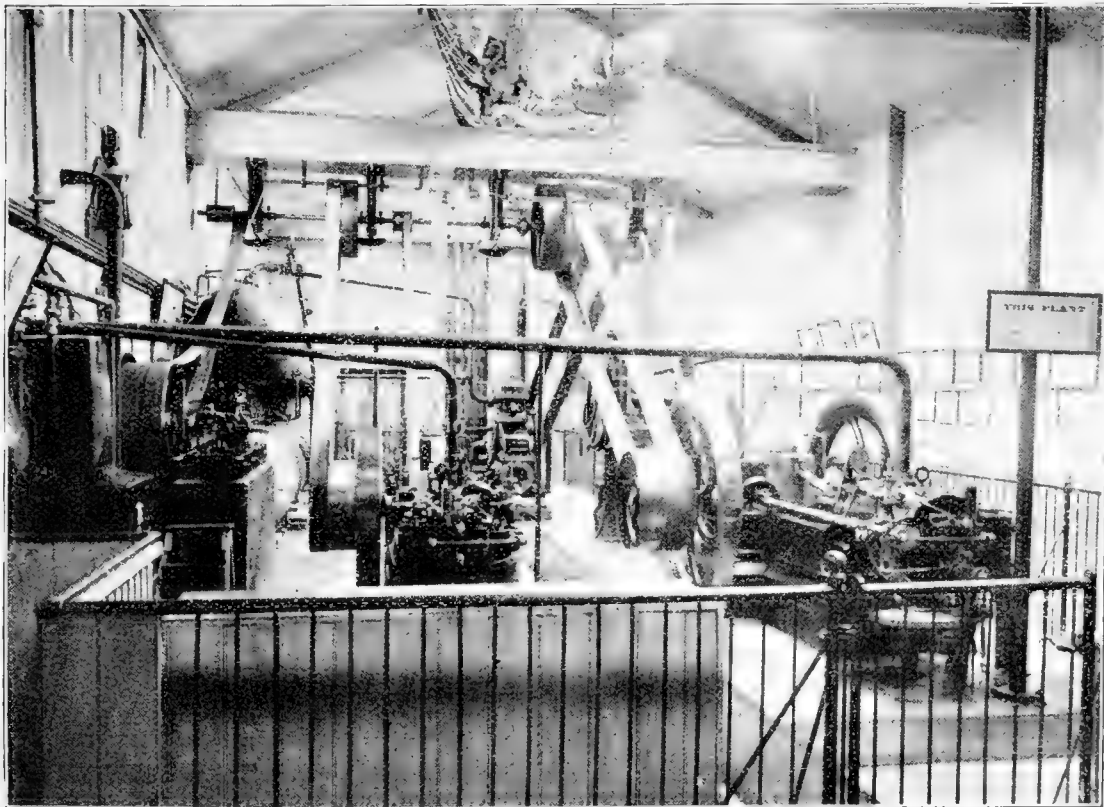
"Roll on, thou deep blue ocean, roll."—*Byron*.

The underground reservoirs always contain three times the quantity of water that is in the show tanks, and it is on the maintenance of this proportion that the successful management of the Aquarium principally depends. As soon as a show tank becomes turbid the water is at once run off and fresh water supplied from the reservoirs.

"All the broad bosom of the ocean keeps
An equal motion; swelling as it sleeps,
Then slowly sinking; curling to the strand,
Faint, lazy waves o'ercreep the ridgy sand,
Or tap the tarry boat with gentle blow,
And back return in silence, smooth and slow."

SYSTEM OF AERATION.

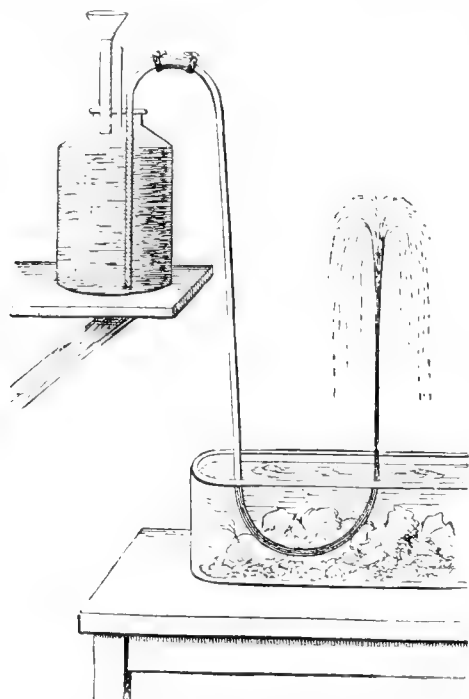
The system of aeration adopted after long and anxious consideration was that by compressed air. The advantages derived are manifold, the most important being that of economy, and it has so far proved most successful. The air is compressed by one of R. G. Ford's compressors, and stored in two cylinders 30 feet long and 3 feet in diameter, up to a pressure



GAS ENGINES, AIR-COMPRESSOR, AND CYLINDERS.

of 157 lbs. to the square inch. The air is then carried to the backs of the tanks, and being taken down to the bottoms in gutta-percha pipes, is seen by the visitor to rise in tiny silvery bubbles to the surface. This constitutes a vital principle, and if the supply of air is stopped for half-an-hour all the fish in the tanks will be seen to be distressed, and in a short time would rise to the surface for air and die. The reason of this is obvious. The fish breathe through their gills, and rob the water in which they are of its oxygen, which has consequently to be artificially supplied to keep them alive.

In establishing Aquaria, the great difficulty has always been to regulate the supply and demand of oxygen in the water. In small Aquaria this can be accomplished by adjusting the proportion of animal and vegetable life. The water plants and sea-weed give off the oxygen which is the life of the fish, and consume the deleterious carbonic acid gas. In large public Aquaria, however, it has been found preferable to employ systems of artificial aeration. This may be accomplished in several ways—by a constant flow of water; by the water being driven into the tanks, so as to impinge on the surface, and carry down minute air particles; by keeping up a constant motion in the surface of the tanks, as by having a small water-wheel revolving and lifting the surface water continuously; or by forcing direct volumes of air into the tanks. This latter system has been adopted at this Aquarium as the most economical and least likely to stoppage or derangement, whilst under its use it is possible to maintain the true character of an Aquarium, that is, the employment of certain quantities of sea-water which are stored and renewed from time to time, the actual waste being reduced to a minimum.



Any person wishing to commence a marine Aquarium on a scientific principle, in which zoophytes and the lower forms of marine life may be kept, can do so very easily by getting a glass dish about the size of a wash-hand basin, placing on the bottom sand and a few stones covered with sea-weed growth, the specimens desired to keep, and a complete aeration can be secured by filling and emptying a glass syringe full of the water several times a day, injecting sharply at a distance of, say, 6 inches from the surface, by which means enough air is carried into the water to keep it fresh and in a natural condition.

In fact, in an Aquarium it is necessary to simulate the action of the sea, where the constant action of the waves and tides acting under natural laws is absolutely necessary to prevent the stagnation of the ocean.

In several of the European Aquaria artificial sea-water has been used with varying success, prepared according to the following formula:—

| | | | | | | | |
|-------------|-----|-----|----------|-----------------------|-----|-----|----------|
| Common salt | ... | ... | 81 parts | Chloride of magnesium | ... | ... | 10 parts |
| Epsom salts | ... | ... | 7 " | Chloride of potassium | ... | ... | 2 " |

The real sea-water, however, is naturally preferable, and is always used where it can be obtained. It may be interesting to give the composition of sea-water according to analysis:—

| | | | | | | | |
|--------------------------------------|-----|-----|---------|----------------------------|-----|-----|----------|
| Water | ... | ... | 964.744 | Gypsum or sulphate of lime | ... | ... | 1.407 |
| Common salt or chloride of sodium | ... | ... | 27.059 | Carbonate of lime | ... | ... | 0.033 |
| Chloride of magnesium | ... | ... | 3.666 | Unaccounted for | ... | ... | 0.002 |
| Chloride of potassium | ... | ... | 0.765 | | | | |
| Bromide of magnesium | ... | ... | 0.029 | | | | |
| Epsom salts or sulphate of magnesium | ... | ... | 2.295 | | | | |
| | | | | | | | 1000.000 |

The last-mentioned component parts occur in infinitesimal quantities in both sea and fresh water, and are therefore not used in producing the artificial fluid.

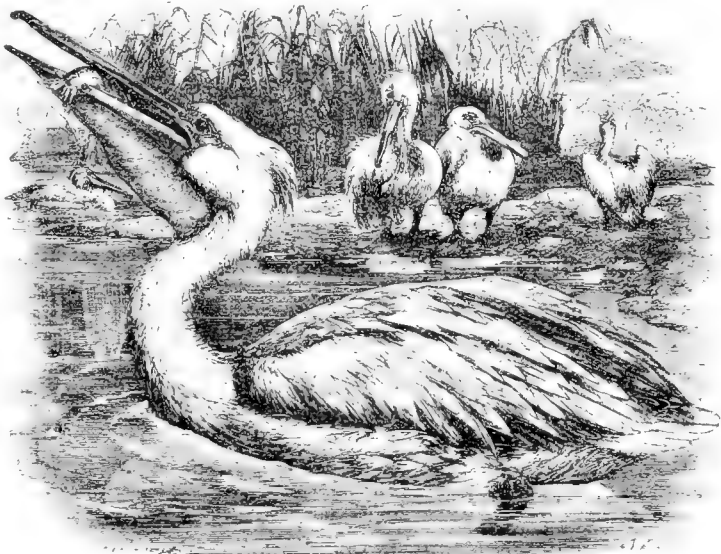
WONDERS OF THE SEA.

The sea occupies three-fifths of the surface of the earth. At the depth of about 3,500 feet waves are not felt. The temperature is the same, varying only a trifle from the ice of the pole to the burning sun of the equator. A mile down the water has a pressure of over a ton to the square inch. If a box 6 feet deep were filled with sea-water and allowed to evaporate under the sun, there would be 2 inches of salt left on the bottom. Taking the average depth of the ocean to be 3 miles, there would be a layer of pure salt 230 feet thick on the bed of the Atlantic. The water is colder at the bottom than at the surface. In the many bays on the coast of Norway the water often freezes at the bottom before it does above. Waves are very deceptive. To look at them in a storm one would think the water travelled. The water stays in the same place, but the motion goes on. Sometimes in storms these waves are 40 feet high, and travel 50 miles an hour—more than twice as fast as the swiftest steam-ship. The distance from valley to valley is generally fifteen times the height, hence a wave 5 feet high will extend over 75 feet of water. The force of the sea dashing on Bell Rock is said to be 17 tons for each square yard. Evaporation is a wonderful power in drawing the water from the sea. Every year a layer of the entire sea, 14 feet thick, is taken up into the clouds. The winds bear their burden into the land, and the water comes down in rain upon the fields, to flow back at last through rivers. The depth of the sea presents an interesting problem. If the Atlantic were lowered from 6,654 feet the distance from shore to shore would be half as great, or 1,500 miles. If lowered a little more than 3 miles, say, 19,680 feet, there would be a road of dry land from Newfoundland to Ireland. This is the plain on which the great Atlantic cables were laid. The Mediterranean is comparatively shallow. A drying up of 660 feet would leave three different seas, and Africa would be joined with Italy. The British Channel is more like a pond, which accounts for its choppy waves. It has been found difficult to get the correct soundings of the Atlantic. A midshipman of the Navy overcame the difficulty, and shot weighing 30 lbs. carries down the line. A hole is bored through the sinker, through which a rod of iron is passed, moving easily back and forth. In the end of the bar a cup is cut out, and the inside coated with lard. The bar is made fast to the line, and a sling holds the shot on. When the bar, which extends below the ball, touches the earth the sling unhooks, and the shot slides off. The lard in the end of the bar holds some of the mud, or whatever may be on the bottom, and a drop shuts over the cup to prevent the water from washing the sand out. When the ground is reached a shock is felt, as if an electric current had passed through the line. Every square mile of the sea contains 120 million fish of various kinds.

ARTIFICIAL SEA-WATER.

I have made numerous experiments with a view to keeping fish alive in artificial sea-water, with only partial success.

In sea-water, prepared according to chemical analysis, the fish became blind and only lived a few days. In water brought up to a standard strength with refined salt made from sea-water, the more hardy kinds of fish did very well, and in water made with Southall's sea-salt, or the salt obtained from the Geelong works, the fish seemed as much at home as in their natural element, and in this water I also got sea-weeds to grow; so that the possession of a marine Aquarium is not dependent on proximity to the sea-shore.



MACHINERY.

Not the least important department of the Aquarium is the Machinery-room. Here is the lung of the establishment in the shape of a Ford's air-compressor, which condenses atmosphere up to a pressure of 150 lbs. to the square inch, and which is stored in two cylinders or receivers,



PERFORMING SEALS AT THE AQUARIUM.

30 feet long and 3 feet in diameter. This is one of the features of this Aquarium, and renders it distinct from all others, where a constant stream of water has to be kept running through to the tanks, as the air is regulated by a system of pressure-gauges, and the attendant, on leaving in the afternoon, simply sets his taps, and the air is supplied in proper quantities till the next morning.

In order to assist in maintaining the proper condition of the tanks, the water is circulated for an hour or more every morning, a separate stream being poured into each tank and carried off by overflow pipes.

The following note from the report of the Director of the Marine Biological Association, Plymouth, explains the system adopted in their Laboratory, which is similar to ours, with this difference, that they have the advantage of a daily supply of salt water from the sea, which we do not enjoy at the Exhibition Aquarium.

The new system adopted for supplying the tanks in the Laboratory with sea-water has shown itself to be a decided improvement upon that originally used. It may be of interest to describe somewhat in detail the method now employed. Water is pumped from the sea at high tide—when possible, only at the highest spring tides—into one of the large underground reservoirs. From thence it is pumped twice daily into the tanks in the centre of the Laboratory upstairs. In the intervals between the pumpings (twelve hours) these tanks are allowed to empty themselves about one-half, the water running from them falling into the Aquarium below. The Aquarium, however, is supplied principally by a constant circulation of water from the second underground reservoir, which thus becomes gradually renewed by the water falling into it from the Laboratory. By this arrangement the water supplied in the Laboratory is such only as has not previously been used, whilst at the same time the water in the second reservoir and the Aquarium is constantly replaced by water from the sea.

There can be no doubt that the water now in the tanks upstairs is much better for delicate work than that in the general circulation of the Aquarium. Foraminifera, which formerly did not develop normally in the water, can now be satisfactorily reared, and colonies of hydroids have sprung up on the sides of the tanks. Two shallow wooden tanks, placed immediately under the windows on the south side, have been especially successful. Green weeds have sprung up all around their sides, together with a few tufts of red weeds, and numerous colonies of hydroids, serpulids, and compound ascidians. In these tanks the most varied animals, including Hydractinia, Sponges, Echinus, Aplysia, and Ascidians have remained quite healthy for several months, and appear to be still in the same condition. From this and other experiments which I have made, I feel little doubt that the direct action of sunlight upon a portion, at least, of the water is an important factor in keeping it in a satisfactory condition to support the more delicate forms of animal life. It is only in the presence of sunlight also that sea-weeds will grow, and in an Aquarium where these grow in quantity a much more abundant supply of the minute forms of animal life which serve as food for the larger is invariably found.

THE FISHES

“ . . . And fish that with their fins and shining scales
Glide under the green wave :
 . . . part single, part with mate
Graze the sea-weed their pasture, and through grooves
Of coral stray, or sporting with quick glance,
Show to the sun their waved coats, dropped with gold.”

Are obtained from Queenscliff, Western Port, and other points in the Bay ; and it is in obtaining such specimens, and landing them safely at the Aquarium, that the great difficulty exists. In the first place, if a fish has been hooked the hook must be gently removed, and the fish placed in the well of the boat, and then kept in a floating cage for some time, to become accustomed to captivity—of course, the same applies to fish caught in nets—and for transit to Melbourne are placed in tins of various shapes, which are provided with an inner compartment of stout calico, which is stretched all round to prevent the fish being hurt. The moment the tins are stocked they must be sent off, and a constant agitation kept up in the water to retain the fish alive. As an illustration of the amount of oxygen required by a fish, I may state that almost any ordinary fish the size of one's hand would exhaust the oxygen in a bucket of still salt water in a quarter of an hour, and would then die unless an artificial aeration was given to the water by some vessel being dipped into the bucket and its contents being allowed to fall some distance through the air to entangle oxygen or forcing in air through a tube connected with a pair of bellows.

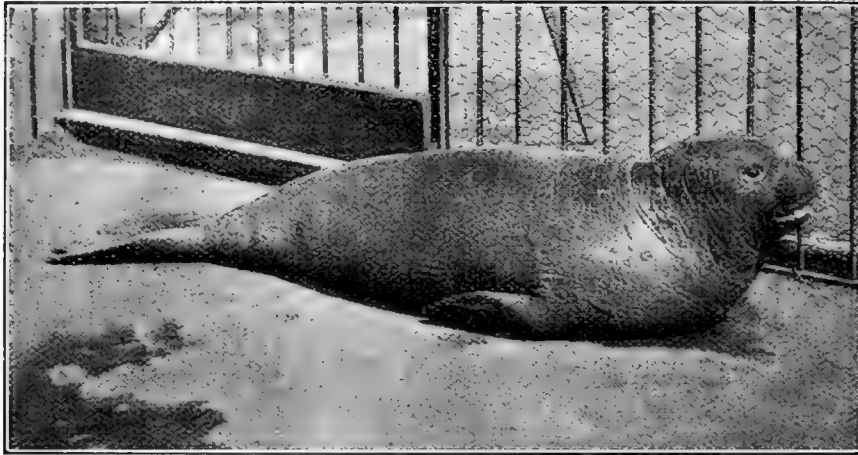


FISH CARRIERS.

FEEDING THE FISH.

The fish are fed regularly every day, and their food consists of fish or meat chopped up into pieces about the size of the top of one finger; they especially favour pilchard. Visitors should make a point of watching the fish at feeding time, as the various methods of the different species in taking their food can be watched with interest. Others feed on small crustacea, or on the sea-weed which is placed in the tanks. They also eat mussels very freely. When possible they are always provided with live food, in order to prevent any detritus accumulating. A favorable food is boiled crayfish.

The Public Aquarium is essentially a modern development, dating its origin from the year 1853, when a "fish-house" was established at the Zoological Gardens, in London. As a sign of nineteenth century progress, it may not take so high a rank as the steam-engine, the



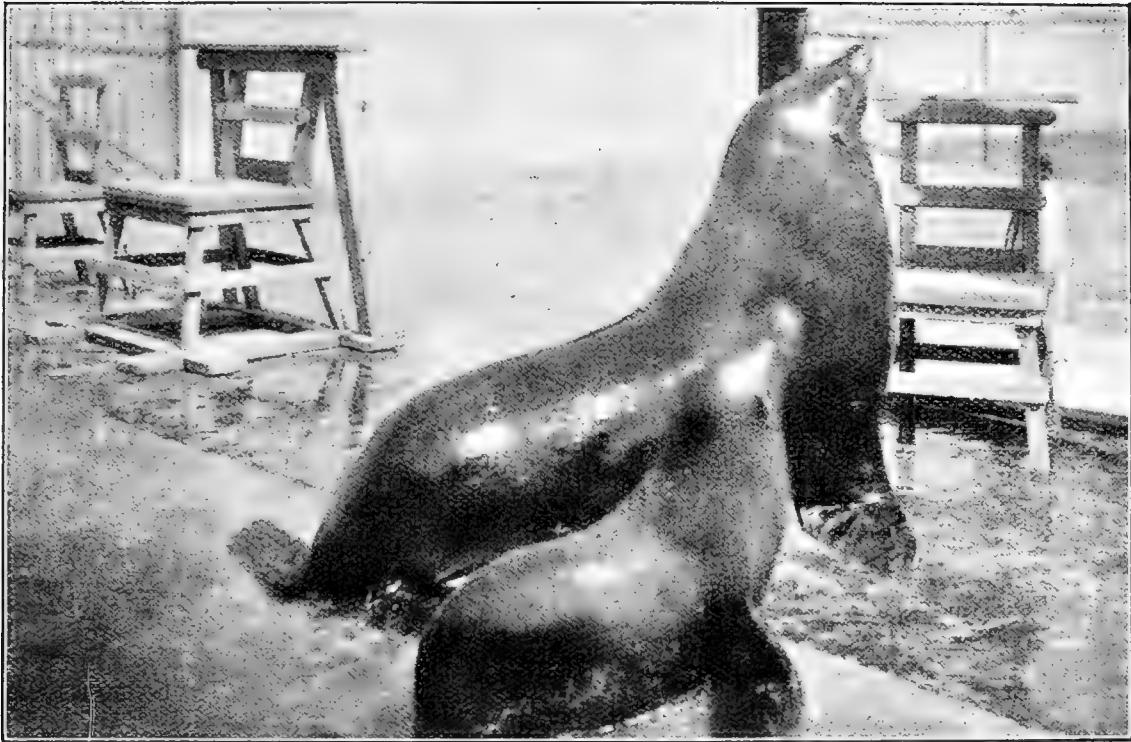
SEA ELEPHANT.

electric telegraph, Imperial federation, and other advanced movements; but, without doubt, it possesses highly useful possibilities, both as a source of harmless amusement and as a popular educator. Already it has helped to dispel some of the ancient myths of the ocean world, and other fables of the deep are fast disappearing into the regions of poetry and fiction. The garlanded nereids have retired into grottoes

unknown, and Neptune himself is now as much out of court as it he had never been saved by Metis' potion. Sirens and mermaids no longer allure the unwary sailor, for they have become so rare that even Barnum cannot find one. The great cuttled kraken, which Bishop Pontoppidan described as like a living island, which many believed could enclose a three-masted ship in the fatal grasp of its sucking arms, and which even Linnæus included in the first edition of his *Systema Nature*, is now an acknowledged creation of fancy; and the sea serpent, that last remnant of the fabled past, is rapidly losing credit. Although perhaps we may cast a lingering and regretful glance on the vanishing myths which charmed and entranced our forefathers, still we can console ourselves with the reflection that we stand on a higher platform when we substitute the study of fact for the credence of fiction. Ichthyology and cognate terms are suggestive of ponderous "dry-as-dust" treatises, but the study of fishes and other marine life can be carried on without dullness. "Dullness does not exist in science is the dictum of an eminent English *savant*, and it is certain that fish life, whether observed from a river bank with an angler's rod and line, or viewed through the less exciting medium of the glass side of an Aquarium tank, affords endless food for interesting reflection.

"Wonderful indeed are all His works,
Pleasant to know and worthiest to be all
Had in remembrance always with delight;
But what created mind can comprehend
Their number, or the wisdom infinite
That brought them forth, but hid their causes deep?"—Milton.

Although Aquaria, as we now understand them, are institutions of a modern growth, the purpose which they serve was in very active operation many years ago. Independently of the Chinese and Japanese, who, from the earliest times, have been in the habit of keeping domestic fish for their amusement, the ancient Romans carried the art of pisciculture to a very high pitch



THE SEALS.



SEA LEOPARD.

of perfection, and spent enormous sums in making channels from their villas at Baia and Naples to the sea-shore, in order to lead the fresh salt water every tide to the intricate system of ponds which existed in connexion with their houses. Advantage was also taken of the habits of those fish which enter fresh water to spawn, as small rivulets were sometimes turned into the channels to simulate a natural river, and the fishes used to go up these channels to spawn, thus stocking the ponds, as the exit of the fry would be stopped by sluice-gates. It was a common feature to have a pond in the banqueting hall, so that guests could see the fish caught before being prepared for the feast, and amuse themselves by watching the dying agonies of their greatest dainty, the Red Mullet, which, in its death, takes the varied hues of the rainbow. The cultivation of this fish at one time became a mania, which must have resembled the tulip fever which occurred early in this century, as in the reign of Caligula we read that as much as £240 was given for a single Mullet, and that the fish ponds of C. Herius were sold for an amount greater than £30,000.

When the visitor has examined the contents of the various tanks, and mused on the infinite variety of marine life here put before him, their difference of form, nature, construction, habit, and being, he may perhaps be induced to say, with Lord Bacon—

“I had rather believe all the fables in the legend and the *Talmud* and the *Alcoran* than that this universal frame is without a mind, and, therefore, God never wrought miracle to convince atheism, because his ordinary works convince it. It is true that a little philosophy inclineth men's minds to atheism, but depth in philosophy bringeth men's minds about to religion; for while the mind of man looketh upon second causes scattered, it may sometimes rest in them and go no further; but when it beholdeth the chain of them confederate and linked together, it must needs fly to Providence and Deity. If this be true of science generally, surely it must be emphatically as regards the animal creation, so vast in its extent, exhibiting at each step such close relationships, and yet such infinite variety, such countless manifestations of supreme design, unspeakable wisdom, of limitless beneficence and omnipresent agency, all pointing out with finger unmistakable the power, the goodness, and the majesty of God.”

“There Science, veil thy daring eye,
Nor dive too deep, nor soar too high
In that divine abyss:
To faith content thy beams to lend,
Her hope assure, her steps befriend,
And light her way to bliss.”

THE SEALS.

(*Phoca vitulina*.)

These animals, which belong to the genus *carnicora*, and are often misnamed fishes, are found along the sea-coasts of all the temperate parts of the globe. The specimens shown in the Aquarium are the *hair* Seal in contradistinction to the *fur* Seal of commerce, which only exists in the colder regions. The term *vitulina* arises from their calf-like bellowing, and is applied to this species on account of the bleating noise made by the young Seals. Seals are strictly amphibious; they exist equally well on land or water, and only frequent the latter element because their limbs are better adapted for swimming than walking, and because their food is found entirely in the sea. Their marine life is not absolutely necessary for their existence. All members of this family are piscivorous, and the amount of fish a Seal can devour is astonishing; and, notwithstanding the fact that they must do enormous damage to the fisheries, they are now protected by law. They cannot breathe below water, but inflate the lungs as does the human animal. The power of the lungs is larger in comparison than in man, and the Seal, taking a bigger breath, has the power of compressing a large quantity of atmospheric air, and so remaining a longer period under water. The nostrils have a beautifully arranged valvular construction which enables an absolute closure of the air passages, and so prevents the pressure of water entering the lungs and causing suffocation. It may not be generally known that pearl-divers and others who do not use the diver's dress, in order to attain this object, are obliged to close the nostrils with an instrument resembling the common clothes-peg. The eye is also specially protected, having a secondary transparent lid which covers the pupil when below water. The ears are also protected with valves. The senses of smelling, hearing, and vision are extremely acute. In the water the fore and hind flippers are used in the same manner as the fins of fishes, and their rate of progression in the water is very swift, as visitors can see for themselves. When they come on land a complete metamorphosis takes place, as their hind legs are tucked under them, as in the accompanying sketch, and the arching of the

spine enables them to travel as quickly as a man can run. The fore and hind flippers are provided with nails, as shown in sketch on following page. Their colour when out of the water is a whity-brown, darker on the back than elsewhere. The specimens in the Aquarium all come from Julia Percy Island where they resort in great numbers every year. Mr. W. H. Disting, of Portland, who has had great opportunities of watching the habits of these animals, informs me that during December and January there are about 3,000 or 4,000 of them on Julia Percy Island. The breeding does arrive there heavy in young, and remain on the island till April or June. For about a month before they leave the young are taught to swim by dabbling about amongst the holes in the rocks. They are polygamous, and during the rutting season the bulls are very savage.

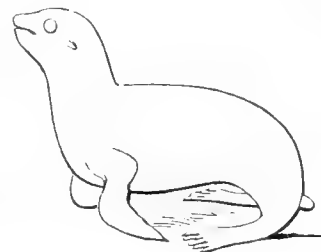


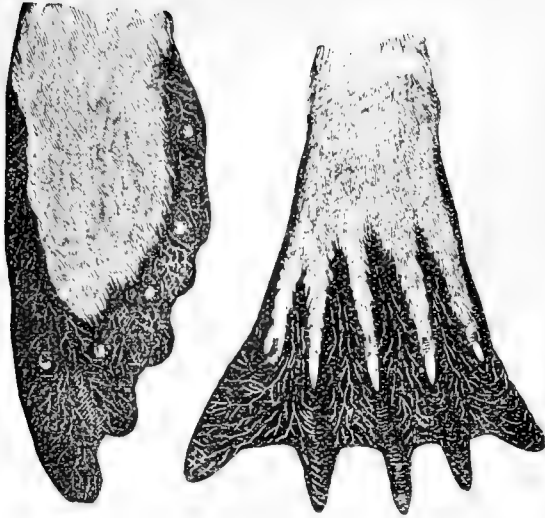
TAME SEALS AND KEEPER.

Each bull selects a favorite camping spot for himself and family, and woe betide any unfortunate young buck who strays within the charmed circle, as he is promptly killed or severely treated. When the Seals are leaving the island and taking to the sea, their great delight is to sport in the billows which surge round the rocks, and here the young get the finishing lessons in the natatory art.

Visitors may be astonished to learn that the Seals become acclimatised to living in fresh water, the only discoverable drawback, so far, being that a few have died from hydatids; but whether this is due to their being kept in fresh water or not I cannot say. In captivity they become very docile, and can be taught any ordinary tricks such as dogs are.

The principal element of their treatment is that which applies to all animals, *i.e.*, kindness combined with firmness, and a cultivation of that which is known in children as "cupboard love." In captivity their ordinary allowance of food is 10 to 12 lbs. of fresh fish daily. Up to the present they have not bred in the Aquarium.





SEAL FLIPPERS.

were any truth in modern zoological theories, the seal might be the transitional form which led from fishes to higher animals. "Oh, no," said the professor, "on the contrary, the seal is an instance of a being belonging to a higher type degenerating into the habits and form of a lower. Seals and walrus are true mammals, as, indeed are those more extreme forms, the whales; they give birth to young, which are unable to feed themselves, as do the highest class of animals, and they suckle them with mother's milk. There is abundant evidence to show that the ancestors of seals were land animals



PERFORMING SEALS.

—beasts of prey, similar in many respects to the bear. A hasty glance at a seal might not, perhaps, lead you to suppose that it had hands and feet, or rather fore paws and hind paws. Yet when you look at it more carefully you perceive that its flippers are in every important respect like hands, there being a wrist and five fingers provided with nails; and what, when hastily glanced at, appears to be analogous to a whale's or dolphin's tale, is really the two hind feet stretched backwards and permanently tied in that position by strong folds of skin; each foot, you will observe, has five toes with toe-nails, and the little stumpy tail lies between the two feet. A man who came across the skeleton of a seal, unless he were versed in osteology, would have great difficulty in distinguishing it from that of an ordinary quadruped; the arm and leg bones, wrists, and ankles, and phalanges would be all there, the only readily noticeable feature being the exceeding shortness of the arms and legs and the undue length of the paws. The ordinary seal has no external ear; but in those seals which are called sea-lions and sea-bears, and sometimes eared seals, there is the remains of an external ear, very small and rudimentary, and, apparently, quite useless; but, by its very presence, bearing witness to the seal's ancestral descent. Now, the ordinary seal can make no use whatever of its hind feet when on land, and its fore feet being buried up to the wrists in the body of the animal, can be used only very clumsily for walking. But in the eared seals, whose rudimentary ears seem to indicate that they are not so far removed as are the common seals from their quadrupedal ancestors, the limbs are less modified. The hind legs, though stretched backwards when the creature swims in water, are not tied back permanently by folds of the skin, and its fore legs are not buried in the body, but from the elbow downwards are quite free. Hence, when

the sea-bear is on land, it can stand on all fours, and can even scratch its head with its hind foot."

"As to the evidence of a seal's affinity to a bear," continued the professor, "it lies chiefly in the skull. The arrangement of the bones in the skull is one of the most permanent characters which distinguish groups of animals, and is much less liable to variation than are the disposition of the limbs or the conformation of the body. The skulls of the eared seals and of the walrus have four decided features, which are characteristically ursine. All the pinnipedia resemble bears in having the five digits complete in both the fore and hind feet; and the eared seals and walrus resemble bears in planting the whole extent of the foot down upon the ground—that is to say, in being plantigrade. The walrus again resembles bears in having three bronchial tubes, instead of only two, as other mammals have. There is one very interesting and suggestive fact which I should not omit to mention to you. While the skull of the eared seal resembles very strongly that of a bear, the skull of the common seal retains those ursine features in a less pronounced degree, and in place of them has already put on many cetacean characters—so much so that, as an eminent naturalist has pointed out, 'if the supra-orbital processes were sawn off, a porpoise's brain-case would closely resemble a seal's.'"

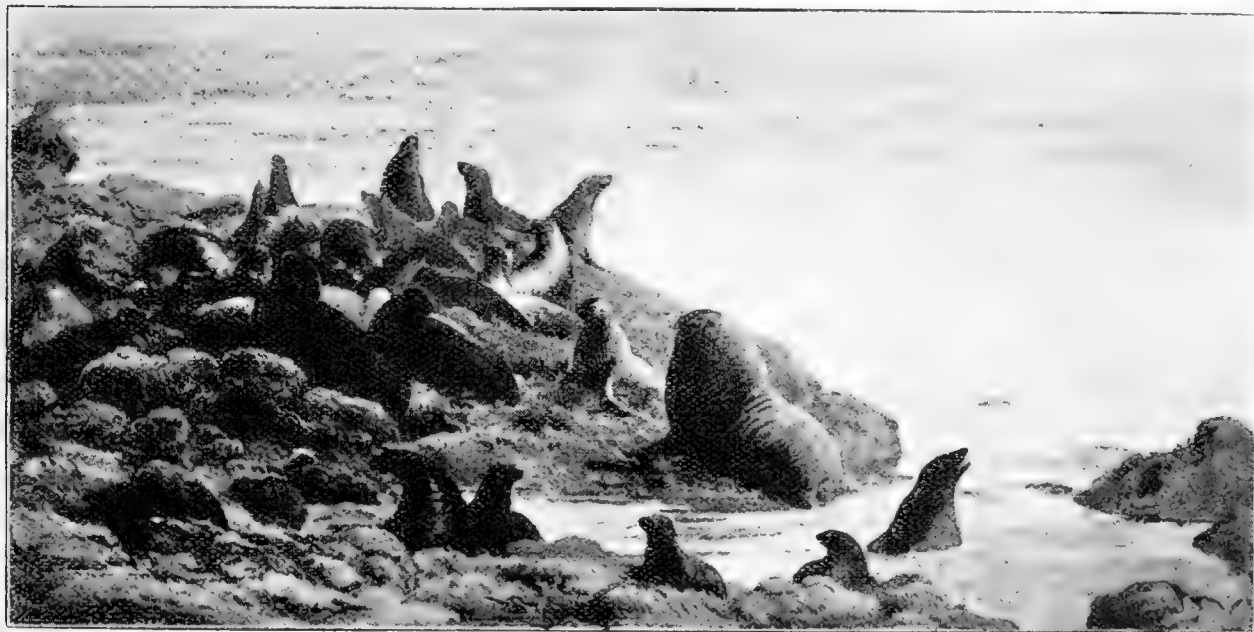
It would not have done to confess ignorance before the professor, or else we might have admitted ourselves surprised at his coupling porpoises with seals. Many of our readers, no doubt, have often varied the monotony of a sea voyage by watching the porpoises playing and diving about the steamer, and have probably made them the topic of conversation

A.N.P. writes as follows:—

The late Frank Buckland told a story of how he was once snubbed by an old sailor for telling him that a whale was not a fish. "Hang it, man," said the old salt, "I have been at sea, man and boy, for 40 years, and you now tell me that a whale is not a fish." And the indignant tar would not even deign to ask Mr. Buckland what he would make out a whale to be. There are no doubt many other people, landmen and seamen both, who hold the same opinion as did the old sailor with regard to the zoological position of the whale. But we imagine there are very few who would take a seal to be a fish, though what a seal may be, beyond being simply a seal, it is not at first sight easy to make out. That it cannot, properly speaking, be called a fish is plain. Its body, looked at in a general way, is certainly unfishlike in appearance, but its head and neck are those of a beast, not to speak of its fur; it lives in water it is true, but it breathes air. It is a sort of thing that is neither fish, flesh, nor fowl. Perhaps it is a transitional form between the fish of the sea and the beasts of the earth.

The question was one which we thought our young friend, "the professor," whose observations concerning the shark were by no means uninteresting, would be best able to answer; so we referred it to him, suggesting that, if there

about the wonders of fish-life. But if what the professor says be true, then such conversation has been only a display of ignorance; for it appears that porpoises are not fishes at all, but mammals, like our own nobler selves. We can scarcely admire the taste of our porpoise and other cetacean congeners. Sea bathing is no doubt very pleasant in its way, but the giving up of all the charms of life on dry land for a permanent residence in the sea implies a weak or perverted understanding. Perhaps, however, these cetacean perverts have been hard pressed on land, have found competition too keen, and have determined to strike out a new line for themselves. If such has been the case, their present condition is a



THE SEAL ROCKS, SAN FRANCISCO.

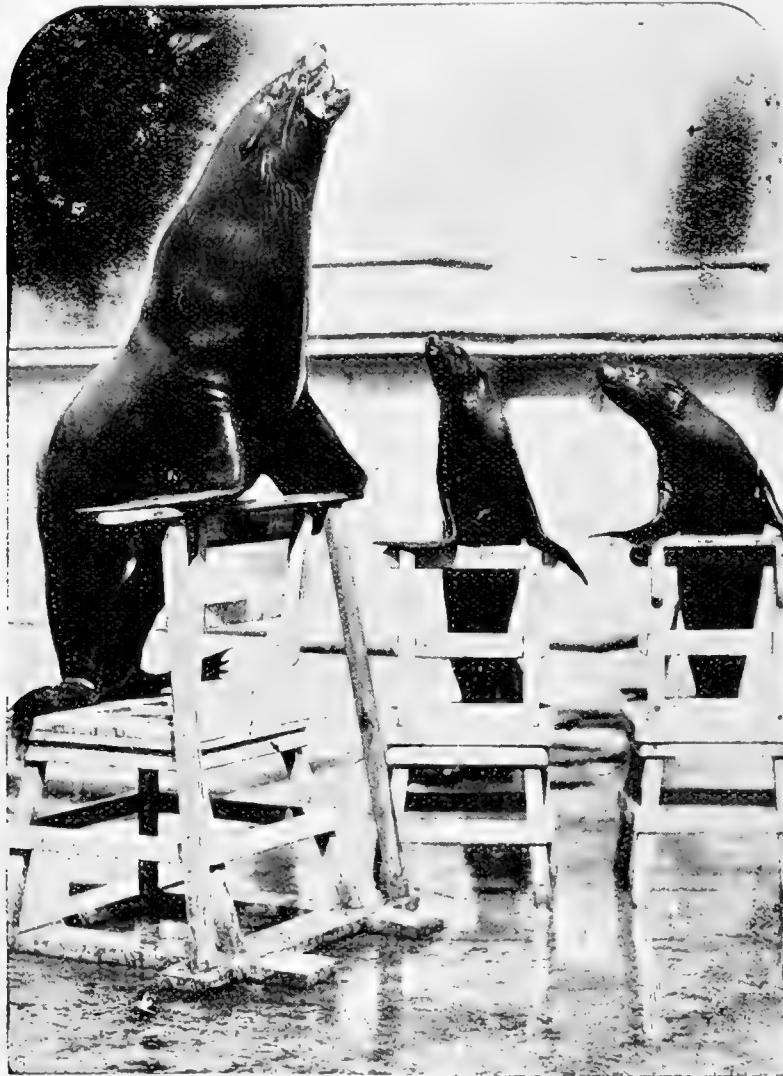
striking warning to those of our own species who find competition keen, and desire to strike out on new lines of their own. The porpoises, dolphins, whales, &c., have no doubt got what they wanted in the way of food; they have the ocean full of fish to feed upon, and their superior brain power enables them to take due advantage of this sea of wealth. But at what a price have they gained their wealth! From the noble state of normal mammalocracy they have become degraded almost to the condition of the fish they feed upon. The pursuit of wealth is not without its dangers.

"Do you then," we asked the professor, "suppose that porpoises and other cetaceans are descended from seals? That the line of descent has gone from bear to sea-bear, from sea-bear to seal, from seal to porpoise, and so on?" "Probably the course of descent has been something in that way," he answered, "though it would be more correct to say that it passed from the early ancestors of the bears to the early ancestors of sea-bears, and from these to the ancestors of seals, and so on through extinct forms, such, for instance, as the fossil *zeuglodon*, to the early cetacea. But it is necessary to bear in mind that there is a wide gap between the seal and the porpoise. Although the seal cannot use its hind legs for walking, still the limbs are there all complete. I have already pointed out, however, that the integument has bound the feet and tail into one mass. In course of generations, as this mass became more fused together, the limb bones, through want of pliability, would become rather a hindrance than a help; and so, according to a principle everywhere seen in the animal world, they would be gradually less developed in different individuals, until finally they became abortive, reaching the condition to be seen in a certain analogous fossil form, where there is nothing left but insignificant hip and thigh bones, and ending, as in the present whales and porpoises, where there is only a mere rudiment of a hip bone. There is one interesting feature which I should not omit to mention. Most mammalian animals have two sets of teeth, an early set, called the milk teeth, and a subsequent permanent set. The seal has these two sets of teeth, but the milk teeth are produced and shed before the young seal is born. The whalebone whales also, which have no need whatever of teeth, shed them all while they are still unborn embryos."

The professor seemed to have many interesting facts with which to support his views concerning the zoological position of the seals, but we observed to him that the idea of land animals, and especially of such highly organized forms as mammalians, changing their condition for a marine existence, was a very strange one, and should not be accepted without abundant evidence. "How is it," we asked, "that we see nothing of these changes going on in the present day?" "Such changes are to be seen," answered the professor; "a familiar example is the otter—an animal nearly allied to the bear in its anatomical structure, though not in size and external form. Its feet are webbed, its ears very small, and on land its movements are slow and awkward. The sea otter (*Enhydra lutris*), with its short and broad limbs, stumpy tail, and round head, bears no distant resemblance to the sea-lions and sea-bears."

Our suggested theory of seals being the transitional forms through which animals had progressed from marine to terrestrial life not having met with the professor's approval, we asked him through what forms he supposed this change had taken place. "Oh, there can be no doubt," said he, "that it was through the mud fishes, such as the *Barramunda* or

Ceratodus of Queensland. The *Ceratodus* is an early form of fish, scarcely more developed than the shark. Like the shark, it has a persistent notochord, and many of its bones are cartilaginous; but it possesses two important structures which fit it for existence on land, namely, an air-bladder, so modified as to enable it to breathe air when on land, whilst it still breathes with its gills when in water, and a heart which has two auricles instead of only one, as in all other fishes. These mud fishes were for a long time classed amongst amphibians, and were not at first recognised as being fish at all. There are many more highly-developed fishes which are able to exist for a great length of time out of water, such, for instance, as the climbing perches of India, which go overland in large droves; but these fishes do so by keeping their gills constantly moistened; they have no true air-breathing apparatus. It is through the lowly mud fishes that the great advance from water to land has taken place. Indeed, all the great advances in animal life have been through low and humble forms. The line of descent which has led to the highest forms has not passed through the crustacea and the wonderfully organized insects, but through the worm; it has not passed through the great cuttle fishes and octopus, but through some lusty ascidian; the entrance to the vertebrates was by the little amphioxus; the entrance to the air-breathing vertebrates was not through the great tyrants of the ocean, but through the despised and lowly mud fish, and the mammalia first appeared in some modest form like the Tasmanian duck-bill or platypus." So that it seems nature teaches us not to despise small beginnings; and that those events which are ushered in with much pomp and pride are not always the most important.

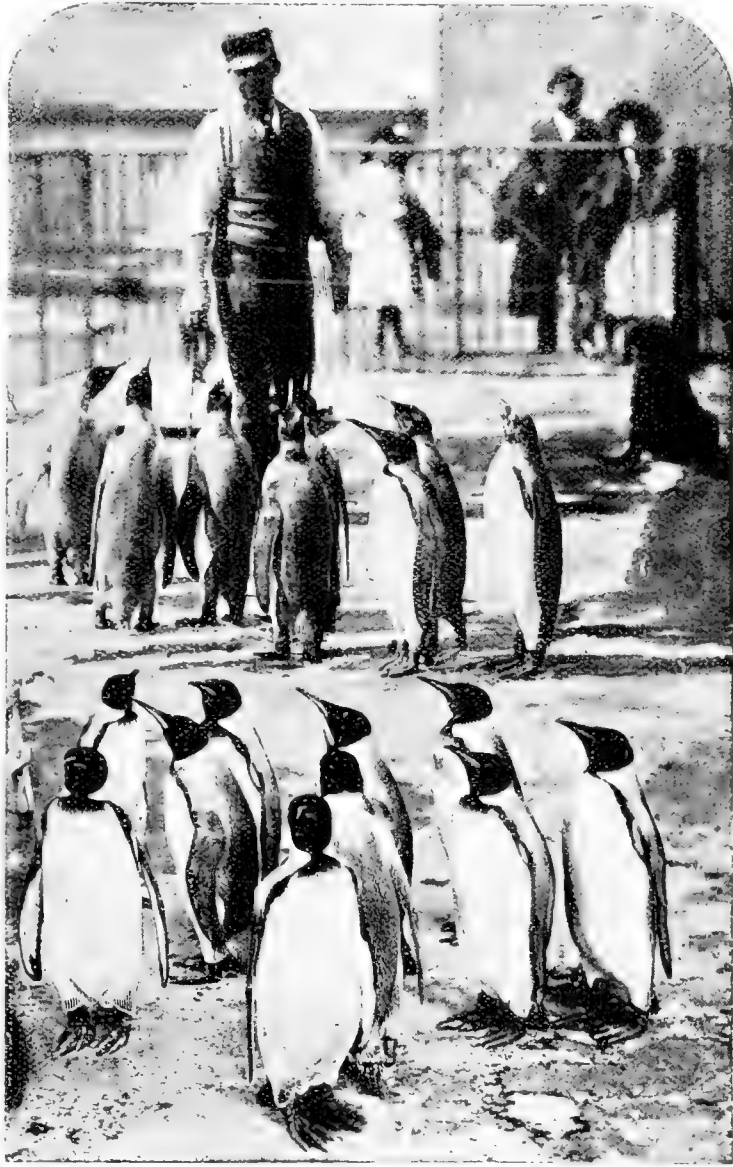


POSITION OF SEALS CATCHING THE FISH WHEN THROWN.

the dog, it becomes greatly attached to man, and many stories are told which display its extraordinary and touching affection. In its natural condition its habits are exceedingly curious; and no more interesting picture can be drawn than that of the domestic life of seals, more especially of eared seals, which are numerous in the southern seas. We take the following from Captain Charles Bryant's account of a sea-lion's "rookery," as the breeding-ground is called. The same rookery is used from year to year. As breeding time approaches, a few old veteran males make their appearance near the shores of the land on which the rookery is situated, and, after two or three days' careful *reconnaissance*, venture ashore, and smell about the place. If their examination is so far satisfactory, then after a day or two some of them climb the slopes, and lie with their heads erect listening. All being as it should be, these scouts depart, and some days after small numbers of male seals of all ages begin to arrive. The old patriarchs take their places near the shore, and compel the younger males to either stay in the water or go to uplands above. Each old male takes possession of a piece of ground 10 feet square. This is necessary for the accommodation of his extensive harem, for he takes from ten to fifteen wives, and it is also required for him to have room to fight in case of necessity, such necessity very often occurring, as we shall see. The male seals continue to arrive in small numbers daily, and the later comers have to fight their way through the ranks of the early comers. Each male tries to get the place he occupied the previous year; probably he finds his claim has been "jumped," whereupon he proceeds to combat; and great is the

But this is wandering from the subject. To come back to the seals. The brain of the seal is not only very large, but richly convoluted, and consequently we find that the animal is proportionately intelligent. Like the otter, it can be tamed, and trained to catch fish at the command and for the benefit of its owner. Like

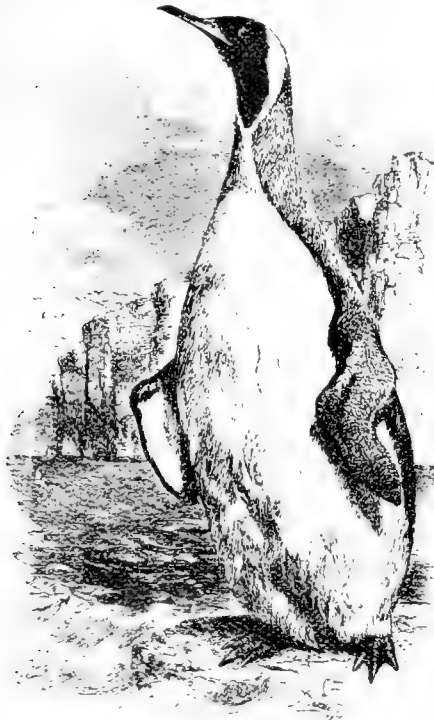
growling and fighting and commotion amongst these unruly males before the whole company get assembled in their places, ready for the arrival of the ladies. It takes them about a month to get properly located, and when they are all there they cover some acres of ground; a strange party of bridegrooms waiting for the brides. Certain of these gentlemen, called "bachelors," remain in the sea, not because they have no appreciation of female charms, but with the very generous object of escorting the ladies as they arrive. Presently the females begin to arrive, in small numbers at first, but afterwards more numerous. As soon as one appears, the bachelors "escort" her, that is to say, lead or drive her ashore, and no sooner has she landed, than the nearest expectant bridegroom, an old male from the front rank, goes down to meet her, bowing and courtesying in a ridiculous fashion, and chuckling in coaxing and endearing terms. This polite manner is, however, all a pretence on the part of the wicked old fellow, for no sooner does he get well between the lady and the water, so that the unsuspecting female cannot escape him, than with a grunt and a growl he drives her home to his harem. By this process the front row of harems gets filled, or almost so. But, in the meantime, the occupants of the back rows are eager for their share of the spoil; they cannot get to the shore on account of their more fortunate neighbours in front; so their only method of providing themselves with brides is by practising extensive and systematic robbery. The males of an upper row select the time when their neighbours of the lower row are off their guard to steal their wives. This they do by taking up the females in their mouths—the females being much smaller than the males—and lifting them into their own circle. If the rightful husband catches the barefaced co-respondent in the act, then there is a fight, which often ends unfortunately for the lady, for both males seizing her at the same time, they not unfrequently rend her in two. It takes a long time, as one may imagine, for all the males to get their harems filled, and those in the back row have often to go poorly served. Still there are many ladies of an accommodating character who are not averse to a change of lords, and who take a favorable opportunity of slipping away at a quiet moment to fill up a vacancy in an adjoining harem. There is no divorce court amongst them, but the offended husband takes the law into his own hand, and consequently fighting and disputing are incessant. In this condition they remain for three or four months, the most marvellous part of the affair being that during that period they eat nothing. They arrive fat and sleek, but they go away thin and careworn.



KING PENGUINS BEING FED.

A seal has none of the altruistic instincts of some other animals, for she will never feed any pup but her own, says the *Popular Science Monthly*. Not a very affectionate mother at best, she yet unerringly knows her nurseling's voice, and he in turn learns to find her. When they meet and recognise each other at meal times, it is easy to see that they belong together. Her duty done, however, she lets it shift for itself till the next feeding time. She instantly knows any little hungry intruder that is stealing up to her to get a meal on the sly. She cuffs and bites until the

starveling, intimidated, slinks away to die. These orphaned younglings are the fruit of the indiscriminate "pelagic" sealing. Their mothers being killed, and they unable to obtain another nurse, they perish by the thousands. A United States report estimates the number for 1896 at 20,331.



KING PENGUIN.

Although a seal can travel pretty fast for a few yards overland, it is hard and hot work for him, so after a march of this distance they stand the companies at ease for a bit to allow the seals time to cool, as the skins are not improved by the animal being hot when killed. They are easily killed with clubs, and as each company marches up they are attended to by a party of Aleuts after they have had their rest.

The following is a description, by an eye-witness (G. G.), of a seal rookery on Behring's Island:—

The big rookery is about 14 miles from the village on the opposite side of the island, and is a shady spit about 70 yards wide, running out less than a quarter of a mile, and ending in rocks, some of them pretty high. This space was just one mass of fur seals. To look at it one would have said it was impossible to stow another one on it, while for a couple of hundred yards around there were numbers of seals playing in the water. The noise was perfectly deafening. It is usually called a bark, but although the old bulls had a hoarser note, the females bleat very like a sheep. There was apparently a hard-and-fast line between each family, and at intervals of half a dozen yards, or, in fact, wherever there was a boulder for him to get on, an old bull was roaring away, and keeping a watchful eye on his numerous wives to see that they didn't stray into the other Johnnie's establishment, which must be a difficult job to prevent, as there is no room for space between the various families.

The seals are of all colours, ranging from a sort of dirty yellow to jet black, most of the cubs being black, and several of the old bulls having a sort of yellow mane. These seals come up every year, the bulls arriving first in June, and having tremendous battles for their various "pitches" with the other males, the beaten ones never being allowed near the others, but on coming ashore draw up by themselves. The females arrive in July, and all hands leave when the young ones are strong enough to travel, about September. The hunters have built small mud huts close to the rookeries, and the day that we were there had had a small "kill" of 500 seals, the seals killed always being the beaten males, or "Holluschuckie." A misty and damp morning is chosen, as the seal does not get so hot, and is better able to travel. The hunters get between the seals and the sea, and drive them inland with sticks, just like so many mobs of sheep, each man taking, perhaps, 50 or 100, and marching close behind the man ahead of him. The huts are built on top of a small hill rising up from the sea coast about 600 yards from the rookery, and the grass and bushes have been cleared away to make a broad track up to the square cleared in front of the huts, a spot fatal to many thousands of seals. The seals are marched up this track, the leading company being halted on the killing-ground, and the remaining companies close up in "quarter column."

THE CROCODILES.

(*Crocodilus porosus*.)

These saurians occupy a large den at the further end of the Aquarium. The larger and darker specimens have been obtained from Northern Queensland. The smaller light-coloured reptile is a native of Siam. Crocodiles have been famous, or rather infamous, from the earliest ages on account of those qualities which have rendered them inimical to man. Their ferocity and destructiveness have always commanded attention and excited fear. Few can have read the sublime Book of Job without being struck with the magnificent and terrible description of the attributes of the leviathan, to which alone the characteristics of leviathan correspond. In ancient Egypt they were deified, and had their regular assemblies of priests, who conducted the rites ascribed to their worship. Herodotus says—"The crocodile some of the Egyptians hold to be sacred, but not all, and in every city where they hold it, as in Thebes and the cities round about the Lake Mæris, they keep one crocodile to which they do special honour. This they train to be tame to the hand, and they put earrings of glass and of gold into his ears, and bracelets on his fore feet, and give it a portion of food day by day, and make offering to it; and when it dies they embalm it, and bury it in the sacred sepulchres. But the people that dwell in the city of Elephantine count them not to be sacred at all, but slay and eat them."

The genus is characterized by the following peculiarities :—The tail is compressed or broadest vertically ; the posterior feet are wholly or partly palmated ; the tongue attached to the mouth, even to its very edges, without being in the least extensible ; a single range of simple pointed teeth. There are five toes on the front, four on the hind feet, only three



CROCODILE, SIXTEEN FEET LONG, FORMERLY ALIVE IN THE AQUARIUM.

toes of each foot being provided with claws. The body, above and below, and the entire length of the tail, are covered with square scales or plates, most of those on the back having ridges or spines of various lengths. Two ridges of spines, forming a double dentated line, are placed at the base of the tail, which subsequently unite or form a single ridge on the remainder of its length. The ears are externally closed by two fleshy slips ; the nostrils form a long narrow canal, which opens interiorly at the back of the throat. The eyes are provided with three lids ; and under the throat are two small pouches which secrete a strong musky substance. Cuvier has divided the genus into three subgenera, viz., *gavials*, having an elongated, narrow beak or snout, generally adorned with a lump or knob on its upper extremity ; *caymans* or *alligators*, with broad snouts, and having four lower teeth to fit into holes excavated for them in the upper jaw ; and *crocodiles* proper, having the head oblong, twice as long as broad, and the four long lower teeth passing by grooves and not entering by cavities into the upper jaw. The gavials are most common in, if not peculiar to, the great rivers of India ; alligators are confined to America, and crocodiles to Africa and Australia, and some of the South Sea Islands. On shore, their shortness of limb and great length and weight of body prevent them chasing their prey, but in the water they can progress with great swiftness. In attacking cattle, or human beings, they are said to first strike and disable them with the tail, in which they have enormous strength, and then seize them with their jaws.

The females make their nests in a curious manner upon the banks of rivers and lagoons, generally in the marshes ; they are obtuse cones, generally about 4 feet high and 4 or 5 feet in diameter at the base, built of mud and grass. A floor of such mortar is first spread upon the ground, on which a layer of eggs having hard shells and larger than those of a common hen are

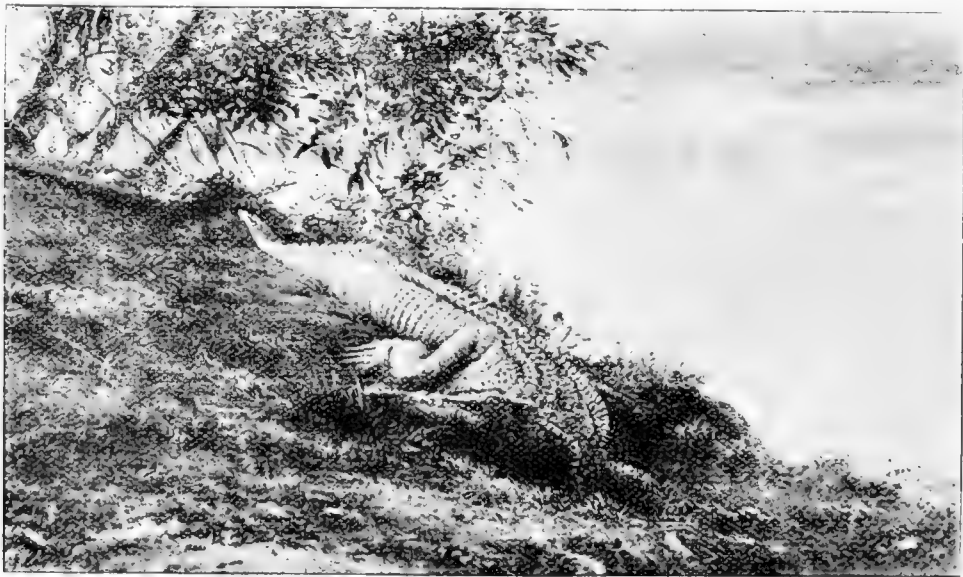
spread. Upon these another layer of mortar 7 or 8 inches in thickness is spread, and then another layer of eggs, and this is repeated. It is not ascertained whether each female watches her own



CROCODILE'S NEST, RAGLAN CREEK, QUEENSLAND

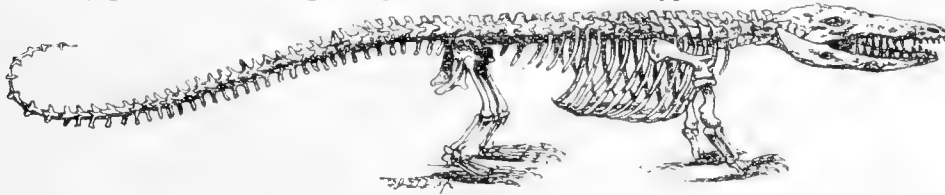
(From a photograph by Miss Grace McKellar.)

nest exclusively or attends to more than her own brood. It is unquestionable, however, that the females keep near the nests and take the young under their vigilant care as soon as they are



WOUNDED ON THE BANKS OF RAGLAN CREEK, QUEENSLAND.

hatched, which takes place five weeks after the nest is made, by the agency of solar heat alone. The young are seen following the mother through the water like a brood of chickens following a hen. By a wise dispensation of Providence the male crocodile is an unnatural parent, and often devours his own offspring, which, together with the fact that they are eagerly sought by hawks and other birds of prey prevents their undue multiplication, otherwise, as each female lays from 50 to over 100 eggs, crocodiles would be too plentiful to allow of other inhabitants of the parts they frequent. The eggs, together with specimens of the newly-hatched baby crocodile, will be seen on a shelf at the centre pane of the front of the den. The North Queensland blacks, and also the Solomon Islanders, consider crocodiles' eggs a *bonne bouche*, and the further they are advanced towards maturity the better they like them. On the other hand, nature provides its own revenges, for old-man crocodile is very fond of young black, male or female. They also like dog. In the Queensland rivers, however, their principal food is fish. Those in the Aquarium are fed on beef, liver, and rabbit; the latter is their favorite food; they are also extremely fond of live eels, but economy prevents the frequent gratification of their appetites with this delicacy, whilst humane

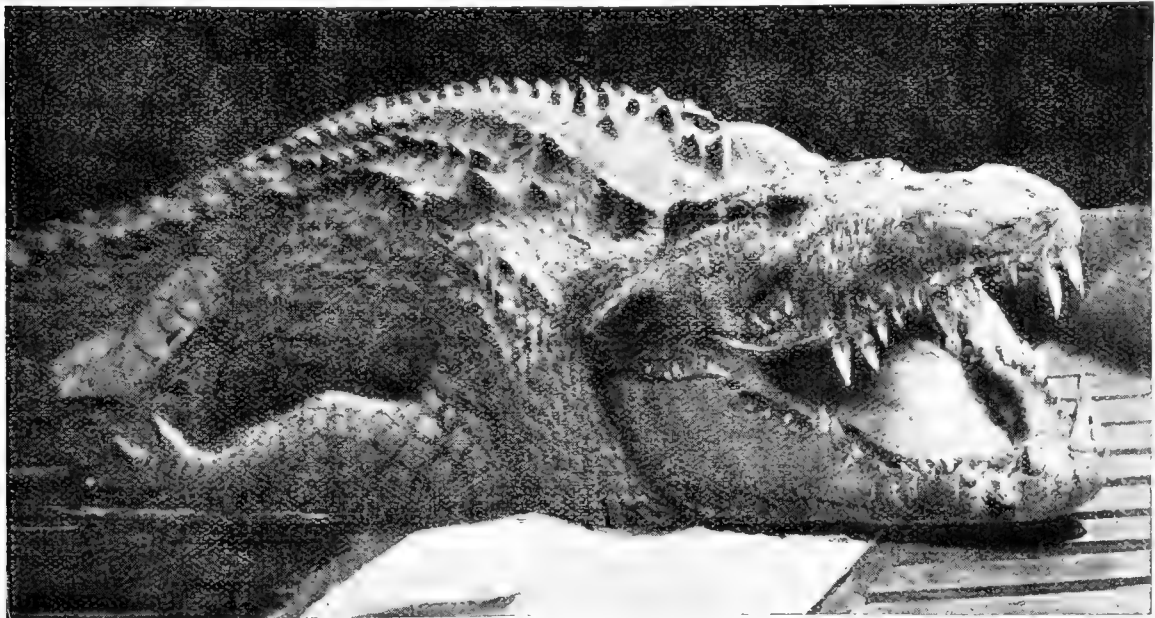


SKELETON OF CROCODILE.

motives and the Society for the Prevention of Cruelty to Animals bars the crocodile den becoming the receptacle for all the stray mon-

grels of the neighbourhood. When killed their stomachs contain quite a small curiosity shop in the way of odds and ends, stones of all sizes, nails, bits of fencing wire, &c., &c. The case containing these can be seen in the Fisheries Court. The largest specimen which has been kept in the Aquarium was 16 feet long, and is now exhibited stuffed in the Museum.

In close proximity can be examined the perfect skeleton of a somewhat smaller reptile. The skin is very tough, but has been erroneously stated to be bullet-proof. This belief has arisen from the fact that each excrescence on the skin is caused by the presence underneath it of a flat hard



SLEEPING CROCODILE.

bone, which in some cases would turn a bullet. Their greatest strength lies in the tail, which is one mass of muscle, and it is their habit to strike any animal they may come in contact with a sweep of their tail, disabling them, before seizing them with the jaws. The eyes are provided with a nictitating membrane or transparent movable pellicle, as in birds. The articulations of the jaws are very peculiar, being placed so far back as to cause the observer to think that the upper and not the lower jaw is moved in opening the mouth. The legs are very short, but strong and muscular; the hind feet have only four toes, which are united towards their base by a strong web, the two interior toes on each of the fore feet and the interior one on the hind feet are destitute of claws. Considering the disproportion between the size of their bodies and their legs it is astonishing how they can travel, as a crocodile can go as fast as a man at a brisk walk. Mr. Bosisto, of Richmond, had a peculiar experience, which he narrates. On a visit to Queensland he was presented with some crocodile eggs, which he brought home and placed in his window, where, to his great surprise, he became the possessor of quite a small family of crocodiles, the eggs having been hatched out by the solar heat. It may be as well to explain the difference between crocodiles and alligators, which is always easily discerned by the shape of their jaws and teeth, the long lower teeth of the crocodiles fitting into a notch in the edge of the upper jaw, and are visible when the jaws are shut, those of the alligators fitting into a pit or cavity in the upper jaw. In crocodiles also the hind legs have a fringe of compressed scales. The specimens here shown are true crocodiles. The stuffed specimen, which can be seen in the Fisheries Court, was the first crocodile shown by the Trustees at the Aquarium. It created a great sensation, owing to its enormous size, and was calculated by scientists to be upwards of 200 years old. An American newspaper prints the following humorous extract:—

A PET ALLIGATOR.

"My boy once had a pet alligator that was pretty fierce," observed Meekin, the lazy inventor. "When he teased this young saurian the beast would swipe out with its powerful tail in an amazing fashion, without doing itself or anybody else any good. It occurred to me that here was a splendid example of wasted energy, and I set out to devise a means of conserving it and turning it to some useful purpose. I spent a winter in Florida, and after I had experimented with some of the small 'gators that are supplied to tourists for a consideration, I ordered some big fellows. After some little trouble I secured ten 'gators, each about four feet in length and of about ten-horse power tail capacity. My scheme for utilizing their tail power—yes, it was a kind of 'tail race'—was this: The 'gators were placed side by side in stalls, which left their tails free to wag. I had upright beams set like pendulums, the swinging end of the beams coming close enough to the 'gators to be in a good position for action. Then I built a tank over the stalls and filled it with thundering big cannon balls. There was an inclined chute running from the tank to a power wheel made with hollow pieces in the rim, something like a water-wheel. In the chute I had a valve to regulate the flow of cannon balls. Half the 'gators were used to work the cannon-ball part of the machine, and the other half to run a conveyor contrivance to lift the balls back into the tank after they had done their work in turning the wheel. I connected a small dynamo by a belt to a pulley wheel on the power-wheel shaft. My main circuit ran from the dynamo to a bank of incandescent lamps, which were to be used in the test. When everything was ready, the wheels oiled up, main switch closed, and the 'gators pretty mad, I hired four little coloured boys to go along in front of the stalls and crack the 'gators on the head with short clubs. This made 'em awfu' mad, and so they struck out with their tails. Then the old shebang commenced to run. A little coon would hit a 'gator on the head, he'd let out with his tail, strike a beam, open the valve, let out a cannon ball, which rolled down the chute and on to the wheel, turning it around. Then the ball rolled back to the conveyor and was hoisted up by one of the other 'gators. She was humming beautifully; but I had forgotten one thing; that was a governor. The little coons liked their work, and lambasted the 'gators unmercifully. I stopped them, but the wild animals were beyond control. They lashed around until the speed got so high that the armature of the dynamo burned out with a flash. The 'gators running the conveyor got into a race with the other fellows, and hoisted up cannon balls so fast that the tank got overweighted and broke down. The cannon balls fell on the 'gators' heads and killed every one of them. Fact, I assure you."—*Kansas City Journal*.

THE PLATYPUS.

(*Ornithorhynchus paradoxus*.)

The Platypus pond will be found in the outside enclosure. As these mammals are very difficult to keep in captivity, it does not always happen that there are specimens in the pond; unfortunately, also, their habits are nocturnal, and when specimens are doing well they are difficult to be seen by visitors. The interior of the earthwork of the pond is laid out in a series of channels somewhat in a manner resembling the sketch on this page, which illustrates the manner in which they construct their burrows.

The full-grown animal is about 20 inches long, having a long flattened body covered with a beautiful thick soft fur, dark-brown above and whitish beneath. The muzzle is elongated,

enlarged, and flattened, resembling the beak of a duck; the teeth are situated in the back part of the mouth, two on each side, with flat tops and no roots. The feet are furnished with a membrane uniting the toes, and in the anterior feet extending beyond the nails. The male has a spur on each of the hind legs. Auent the properties of this spur, the following correspondence recently appeared in the daily press:—

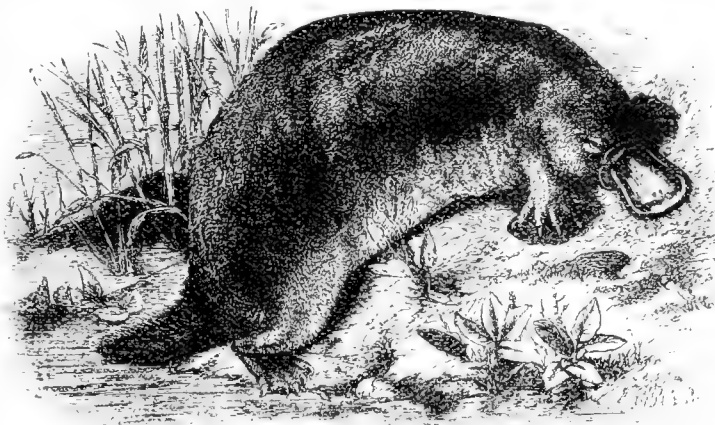
THE SPUR OF THE PLATYPUS.

TO THE EDITOR OF THE "ARGUS."

Sir,—The letter of Mr. Round, of War-ragul, has drawn attention to the very interesting case read before the Medical Society by Dr. Lalor, of Richmond. His quotation from Darwin is correct. It is impossible to understand how such a statement could have got into his great book, for it appears, so far as I can find, to be absolutely false. As everybody has not got such a ponderous work as the *Encyclopædia Britannica* at his elbow, I wish you would be good enough to print the following quotation. Further true anatomical and physiological facts may be found in the late Professor Owen's *Comparative Anatomy of the Vertebrates*.—I am, &c.,

University, 24th April.

GEORGE B. HALFORD.



PLATYPUS.

"ENCYCLOPÆDIA BRITANNICA," VOL. XIX., P. 214, ART. "THE PLATYPUS" (BY PROF. W. H. FLOWER).—"The limbs are very short, each with fine well-developed toes provided with strong claws. In the fore feet the web not only fills the spaces between the toes, but extends considerably beyond the ends of the long, broad, and somewhat flattened nails, giving great expanse to the foot when used for swimming, though capable of being folded back on the palm when the animal is burrowing or walking on the land. On the hind foot the nails are long, curved, and pointed, and the web extends only to their base. On the heel of the male is a strong, curved, sharply-pointed movable horny spur directed upwards and backwards, attached by its expanded base to the accessory bone of the tarsus. This spur, which attains the length of nearly an inch, is traversed by a minute canal, terminating in a fine longitudinal slit near the point, and connected at its base with the duct of a large gland situated at the back part of the thigh. The whole apparatus is so exactly analogous in structure to the poison gland and tooth of a venomous snake as to suggest a similar function, but evidence that the platypus ever employs its spur as an offensive weapon has, at all events, until lately been wanting. A case is, however, related by Mr. Spicer in the proceedings of the Royal Society of Tasmania for 1876



THE HOME OF THE PLATYPUS.

(p. 162), of a captured platypus inflicting a severe wound by a powerful lateral and inward movement of the hind legs, which wound was followed by symptoms of active local poisoning. It is not improbable that both the inclination to use the weapon and the activity of the secretion of the gland may be limited to the breeding season, and that their purpose may be, like that of the antlers of the deer and many similar organs, for combat among the males. In the young of both sexes the spur is present in a rudimentary condition, but it disappears in the adult females."

TO THE EDITOR OF THE "ARGUS."

Sir,—The letter you were good enough to publish re the spur of the platypus has drawn the following interesting remarks from Mr. G. W. Rusden:—

"About fifty years ago an instance of the effect of the poison came under my notice at the Murrumbidgee River. A very active, intelligent native was, with another native, in a bark canoe. He speared a platypus, and when he was in the act of bringing it to the edge of the canoe some misadventure nearly caused the capsizing of the canoe. In preventing the upsetting of the crank canoe the hand of the native was put within the range of the platypus' hind feet. The creature in its death struggles dug its spurs into the man's wrist. He had no sooner landed on the bank than he felt faint and had to rest, very much overcome by faintness. After less than an hour he showed me the swelling at the places of puncture. The arm, especially at the shoulder, was very much swollen for many days, and the swelling of the glands so painful that the arm was useless for some time. When all swelling had subsided, the arm was smaller than the man's left arm, and for several weeks appeared to be undergoing atrophy. However, it regained its tone; and the first use my friend made of it was by taking a canoe a few miles down the river and spearing nine fine specimens of the platypus, by way of revenge for his former mishap. He promised me the spoil, and gave me the skins." These curious creatures are fast disappearing from the earth. They lay eggs like a bird, but the hatching of the young is of the amphibian type; they suckle their young on shore, and are, in the opinion of advanced Darwinianists, the primæval ancestors of man. "*L'Histoire est vraiment singulière!*"—Yours, &c.,

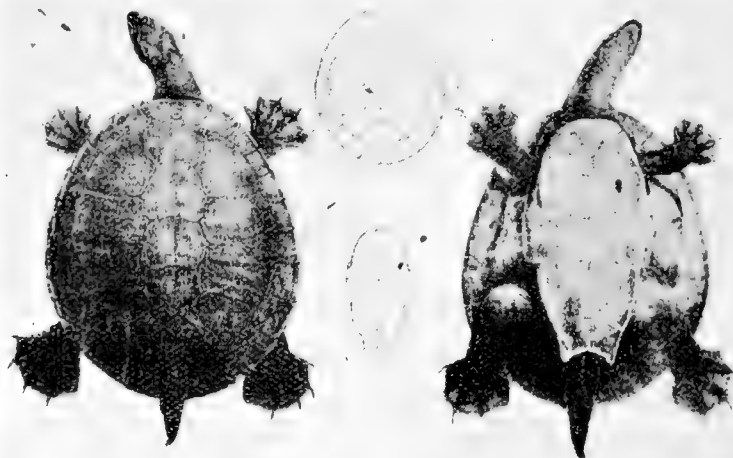
University, May 9.

GEORGE B. HALFORD.

Its food consists of frogs, worms, and insects. Recent researches have proved that they are oviparous, and the eggs have been found in various stages, but the scarcity of the animal and the inaccessibility of its habitat has rendered it difficult to obtain much reliable information on the subject. A number of stuffed specimens can be inspected in the Zoological Department of the Museum by those who are interested in this unique member of the fauna peculiar to Australia.

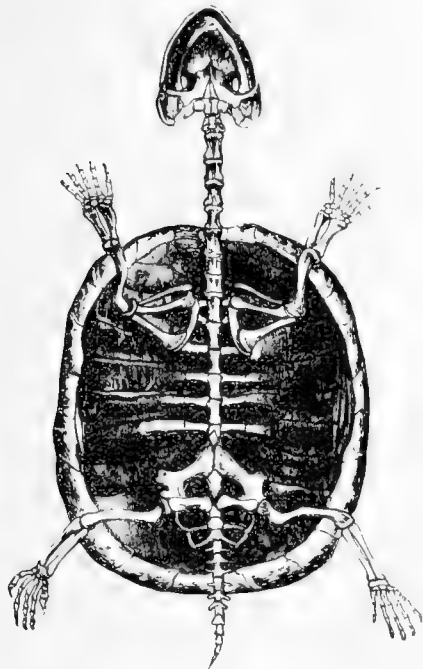
MUD TURTLES.

The curious reptiles known by the generic name of Tortoises are remarkable for being an example of the skeleton being brought to the surface of the body, as the upper shell or carapace and the lower shell or plastron are in reality a broadening out of the ribs and of the chest bones, a complete box being formed into which the animal can completely withdraw its legs, head, and tail.



In Decade IX. of his *Prodromus of the Zoology of Victoria*, Sir Frederick McCoy writes:—

This species varies much in the rugosity of the upper plates and in the depth of the shell, some of the same age and sex being much smoother and flatter than others. The males usually are narrower and deeper or more convex, thicker and more rugose than the females, and with larger tails. The young are more nearly orbicular, and with the notches in the

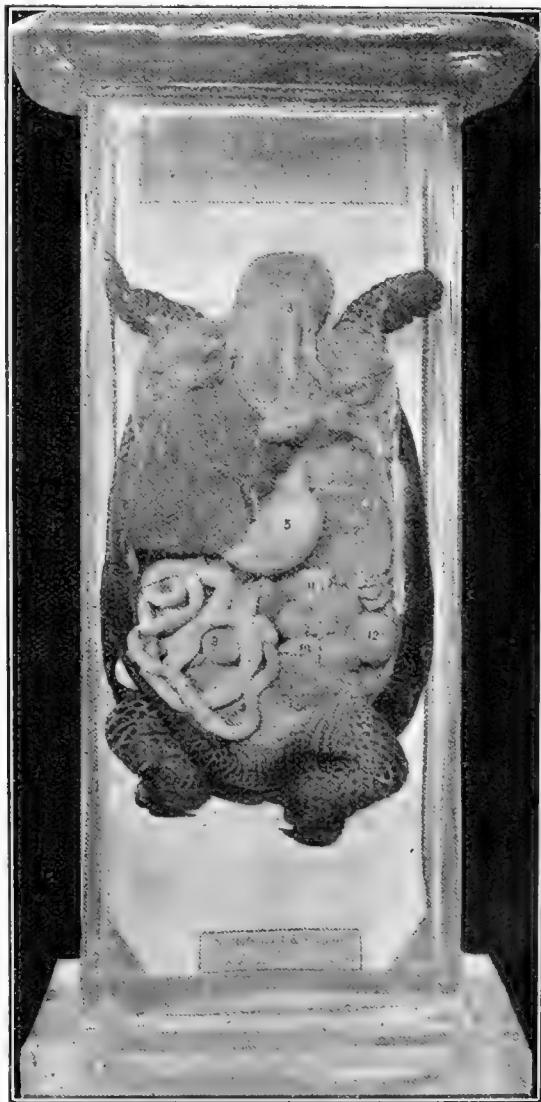


SKELETON OF TURTLE.

posterior marginal plates very much deeper and more conspicuous than in the adults, and with, of course, the shields covering the shell very much thinner. A series of measurements also shows that the proportion of length to width of the vertebral plates also varies greatly in specimens otherwise perfectly alike, the fourth vertebral plate being sometimes as long as wide, and sometimes nearly twice as long. The upper surface of the carapace is uniformly of a very dark-brownish or blackish olive; the marbling with grey which is mentioned by older writers only appearing in dried specimens; the underside of the sternum is always of a nearly uniform yellow ochre tint, becoming of a more greenish or brownish hue towards the marginal plates, but without dark margins or spots; the skin is uniform blackish, except the edges of the jaws and the streak from them along the sides of the neck and touching the lower edge of the ear drum which is yellow.

The size of the granules on the skin of the neck varies considerably also irrespective of other characters. The so-called beard or barbels are two minute, soft, retractile, conical tubercles or papillae, very likely to be overlooked, as when retracted they only leave a smooth oval spot. The presence or absence of this so-called beard cannot be taken as a character of generic value with advantage, as it varies so much like the other appendages of the skin.

These mud tortoises can scarcely be said to differ generically from the South American *Platemys* and *Hydraspis*, the two barbels under the chin being really present in all the specimens if carefully looked for, and the slightly more distinct plating of the temples with small polygonal shields constituting a very slight ground for generic distinction. The eggs have a strong white calcareous shell of a slightly ovate form, very little wider at one end than the other, bluntly rounded at each end.



PREPARED SPECIMEN SHOWING INTERNAL ORGANISM OF MUD TURTLE.

FISHES.

(Pisces.)

This class embraces all those inhabitants of the water who cannot live any time out of it; they swim by means of fins, breathe by gills, where the blood, which is cold, comes in contact with the oxygen in the water for the aeration of their system. Their gills breathe water as the lungs of other animals breathe air. The reason a fish dies when it is taken out of the water is because the delicate gill membranes become dry and collapse against each other, so that the



PREPARED SPECIMEN SHOWING INTERNAL ORGANISM OF FISH.

circulation of the blood is stopped, and the oxygen of the atmosphere can no longer act upon it. The blood is circulated by a heart with two chambers, an auricle and a ventricle, which lies just behind the gills. In nearly every instance fish propagate their species by means of eggs, and are, therefore, called oviparous. The propelling power of the fish is almost entirely supplied by the tail, the fins being almost exclusively used for balancing. The fins are termed "dorsal," "pectoral," "anal," "abdominal," and "caudal" or tail. The dorsal fins are situated on the back, the pectoral on what might be called the shoulders, the anal near the vent, the abdominal or ventral may be said to correspond with the hinder limbs of quadrupeds, whilst the caudal is commonly known as the tail. The scales are beautifully constructed, overlapping each other closely, and forming a natural sheathing, to allow of swift progression through the water. The skin of the fish is supplied with pores, which permit of the exudation of a secretion of a mucous substance which nature supplies as a lubricator. On most fishes will be observed a lateral streak or line extending from the head to the tail, whence this lubrication principally exudes; the scales on this line are perforated. The lateral line is supplied with nerves, and is termed the muciferous system. The optic nerve of fishes varies in different species; in some cases the nerve leads straight to the brain, in others the nerves cross so that the right eye is connected with the left side of the brain, and *vice versa*; whereas in the case of rays, sharks, &c., the optic nerves join, and lead in a united band to the brain. The arrangement of the bones is so complicated and peculiar that reference to the illustration below will give a better idea of the subject than pages of description.

Fish are of distinct sexes, and are almost entirely oviparous, the eggs being deposited by the females, fertilization by the male taking place immediately afterwards.

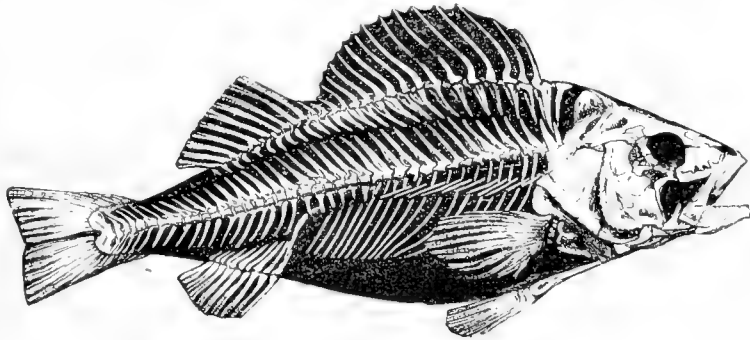
As can be well understood, the majority of fish in this Aquarium are those which are termed *littoral* or shore-fish; *pelagic* or deep-sea fish being difficult to obtain, and also more difficult to maintain alive under

artificial conditions, as they are not so accustomed to changes of temperature and density of water as the fish which frequent the shores of our coasts.

By the naturalist fish are classed under a number of orders, such as—Acanthopterygii or spine-finned, which is the most comprehensive; Acanthini, with vertical and ventral fins, without

spinous rays; Physostomi, with reticulated fin; Lophobranchii, with gills branched together and attached to branchial arches; Chondropterygii, with cartilaginous skeleton; and many other orders, which are again divided into classes and families.

The latest systematic census of indigenous fish hitherto recorded in Victorian waters is contained in a paper read by A. H. S. Lucas, Esq., M.A., B.Sc., before the Royal Society of Victoria on 6th April, 1896, which I have much pleasure in reprinting for the benefit of those readers who desire to enter into the scientific classification of our Victorian fishes.



SKELETON OF FISH.

A SYSTEMATIC CENSUS OF INDIGENOUS FISH HITHERTO RECORDED FROM VICTORIAN WATERS.

By A. H. S. LUCAS, M.A., B.Sc.

Introduction.

The classification followed in this census is that adopted by the Hon. Sir William Macleay in his *Descriptive Catalogue of Australian Fish*. It is, in the main, that of Dr. Günther, as elaborated in his *Catalogue of Fishes of the British Museum*.

To each species is appended:—(1) The name of the author who either originally described it or who gave the specific name finally accepted, and an exact reference to the work in which the description or denomination first appeared, with the date of publication. (2) References to the more important synonyms, in cases where it was thought any ambiguity might exist. (3) A reference to the figure in case of those fish which have been figured. Where a fish has been figured more than once, usually only the latest or most accessible figure is recorded. The most important of these illustrations are the figures in the plates of Professor McCoy's *Prodromus of Victorian Zoology*. (4) The localities from which the species have been obtained, as far as known with precision. (5) The vernacular name as used in Victoria. Those species of which only single specimens have been obtained appear in parentheses, as do any others of whose occurrence in Victorian waters there is any doubt. Amongst these last I have included all the species described or labelled as coming from Hobson's Bay or Port Phillip by Dr. Klünzinger, in the *Archiv. f. Naturg.*, xxxvii, 1872, since it seems probable that some South Australian fish have been confused with others sent to the Stuttgart Museum from Victoria. It seemed wiser to incorporate in the census the species as given by so considerable an authority as Dr. Klünzinger, but questions of local distribution can only be satisfactorily settled by resident local workers, and it remains for evidence to be forthcoming to vindicate Dr. Klünzinger's Victorian records.

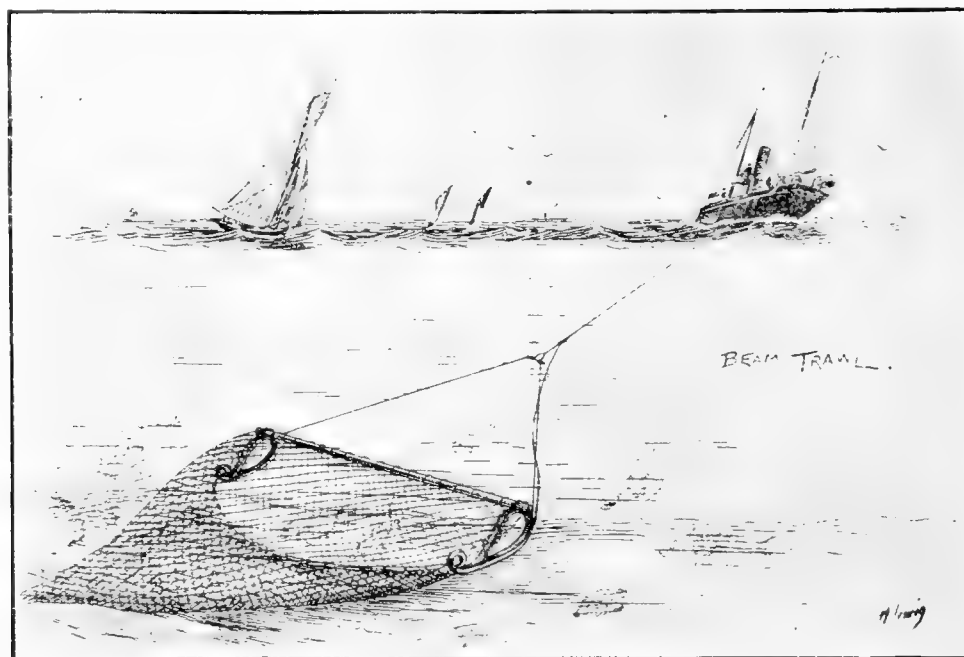
As it stands, the list includes 233 species. There can be no doubt but that many additions will be made, especially of smaller species, and of species living in deeper waters which require the use of the trawl for their capture. On the other hand, it seems highly probable that several forms ranked as species are really but varieties. This is notably the case in the genera *Monacanthus*, *Labrichthys*, and possibly *Galaxias*.



HORSE MACKEREL.

reprinted from
Proc. Royal Soc.
Victoria (n.s.)
2: 15-47
1896 (1884)

Our fish fauna has been very tardily worked out, and much remains to be done even now. A few of our fish are world-wide in their distribution, and the species thus secured the great Linnaeus as their sponsor. The first strictly Australian species described are, I believe, to be found in the pages of *White's Journal to New South Wales*, published in 1790. Amongst these a very few Victorian forms are figured, in company with the Great Brown Kingfisher, and other "*species non-descripti*," as White terms them. As expeditions from Europe became more frequent, Australian fish appear in the systematic works, first of Bloch and of Lacépède, and later on of Cuvier and Valenciennes. The voyages of the Freycinet Expedition, of the *Astrolabe*, *Beagle*, *Erebus*, and *Terror*, added a large number of Australian species in the Zoological Appendices to their Narratives. To Drs. Quoy and Gaimard, to Jenyns, and to Sir John Richardson we owe thus a number of descriptions. To the latter, too, were forwarded several consignments of Tasmanian fish, and of course many of these are common to Victoria and Tasmania; but it was not until 1872 that a serious study was made of Victorian forms proper. In that year Count F. de Castelnau, well known for his previous researches on the fish of South America and of the Cape of Good Hope, published, in the *Proceedings of the Zoological Society of Victoria*, descriptions of about 150 species, which he had obtained mostly from the Melbourne Fish Market. In the succeeding year he added notes on more species. The Count's labours have made the work of those who follow him mainly of a supplementary nature. Amongst others who have worked during the last twenty years at our fishes have been Drs. Gunther, Steindachner, Klunzinger, and especially the Hon. Sir William Macleay, of Sydney, who has done so much for Australian Ichthyology in many ways, and most of all by the publication of his excellent *Descriptive Catalogue of Australian Fish*. Finally, Professor McCoy has given detailed descriptions and figures, usually in colours, of over 50 species of our Victorian fish.



STEAMER WITH BEAM TRAWL.

SUB-CLASS I.—TELEOSTEI.

ORDER I.—ACANTHOPTERYGII.

DIVISION I.—ACANTHOPTERYGII PERCIFORMES.

FAMILY PERCIDÆ.

LATES, Cuvier.

L. colonorum, Gunther, A.M.N.H., p. 114, 1863.

Macleay Cat. 2.

Figured, McCoy, Prodr. Zool. Vict., pl. 14.

Loc.—Gippsland Lakes. Occurs also at Sandridge and at the mouth of the Saltwater River, McCoy, l.c.

Vernacular name—*Gippsland Perch*.

L. similis, Castelnau, P.Z.S. Vict. I, p. 44, 1872.

Macleay Cat. 3.

Loc.—Gippsland Lakes, scarce, Castelnau, l.c.

LATES, Cuvier—continued.

L. antarcticus, Castelnau, P.Z.S. Vict. I, p. 44, 1872.

Macleay Cat. 4.

Syn.—*L. colonorum*, var., McCoy, l.c.

Vernacular name—*Sea Perch*.

L. victorice, Castelnau, P.Z.S. Vict. I, p. 45, 1872.

Macleay Cat. 5.

MICROPERCA, Castelnau.

M. Yarra, Castelnau, P.Z.S. Vict. I, p. 48, 1872.

Macleay Cat. 12.

Loc.—Lower Yarra, Castelnau, l.c.

ENOPLONUS, Lacépède.

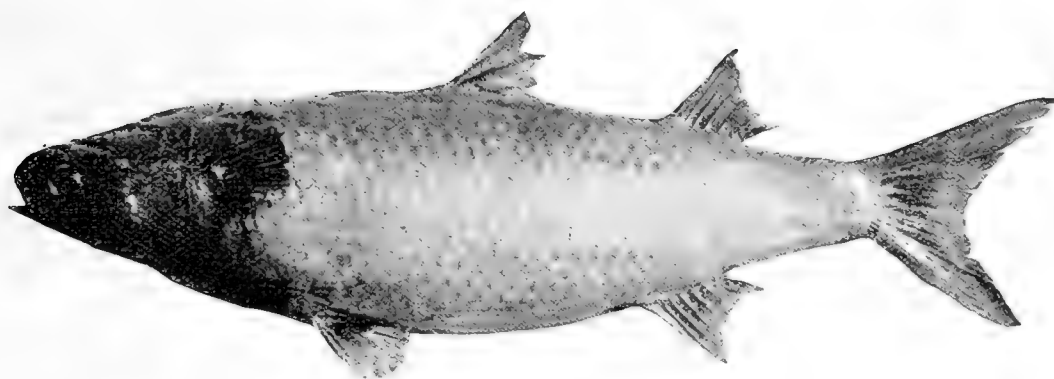
E. armatus, white sp., Voyage to N.S.W., 1790.

Gunther Cat. I, p. 81; Macleay Cat. 13.

Figured White, Voy. to N.S.W., pl. 39.

Loc.—Pussim.

Vernacular name—*Bastard Dorey*, *Old Wife*, *Zebra fish*.



SAND MULLET.

(ANTHIAS, Bloch.)

- (*A. rufus*, Richardson, P.Z.S. p. 95, 1839.)
 Günther Cat. I, p. 93; Macleay Cat. 16.
 Figured, Richardson, T.Z.S. 1849, pl. 4.
 Loc.—One specimen from Western Port, Castelnau,
 P.Z.S. Vict. I, p. 51.
 Vernacular name—*Tasmanian Red Perch* or *Barber*.

(NANNOPERCA, Günther.)

- (*N. obscura*, Klunzinger, Archiv. f. Naturg., xxxviii,
 1872.)
 Macleay Cat. Sup. 1144.
 Loc.—"Yarra Lagoon," Klunzinger, l.c.

APOGON, Lacépède.

- A. Güntheri*, Castelnau, P.Z.S. Vict. I, p. 46, 1872.
 Macleay Cat. 91.
 Syn.—Perhaps—*A. novae hollandiae*, Val. (Macleay,
 l.c.)
 (*A. conspersus*, Klunzinger, Archiv. f. Naturg., xxxviii,
 1872.)
 Macleay, Cat. Sup. 1141.
 Loc.—Port Phillip, Klunzinger, l.c.

ARRIPIS, Jenyns.

- A. truttaceus*, Cuv. et Val., Poissons III, p. 50, 1829.
 Günther Cat. I, p. 253; Macleay Cat. 112.
 Syn.—Includes *A. salar*, Richardson, T.Z.S. III, p. 78.
 Figured, McCoy, Prodr. Zool. Vict., pl. 16, 17.
 Loc.—*Passim*.
 Vernacular name—*Salmon* and *Salmon-trout*.
A. georgianus, Cuv. et Val., Poissons VII, p. 451,
 1831.
 Macleay Cat. 111.
 Figured, Richardson, Voy. Erebus and Terror, pl. 54.
 Loc.—Common, according to Count Castelnau. I have
 not seen it.
 Vernacular name—*Roughy*.

OLIGORUS, Günther

- O. macquariensis*, Cuv. et Val., Poissons III, p. 58,
 1829.
 Günther Cat. I, p. 251; Macleay Cat. 114.
 Figured, McCoy, Prodr. Zool. Vict., pl. 85, 86.
 Loc.—Murray and tributaries; now Yarra.
 Vernacular name—*Murray Cod*.
O. mitchellii, Castelnau, P.Z.S. Vict. II, p. 150, 1873,
 Macleay Cat. 115.
 Loc.—Murray R., Castelnau, l.c.
 Vernacular name—*Murray Perch*

CTENOLATES, Günther.

- C. ambiguus*, Richardson, Voy. Erebus and Terror, p.
 25, 1846.
 Günther Cat. I, p. 270; Macleay Cat. 118.
 Figured, McCoy, Prodr. Zool. Vict. pl. 84.
 Syn.—*Dules auratus*, Castelnau, P.Z.S. Vict. I, p. 55.
 Loc.—Murray and tributaries.
 Vernacular name—*Murray Golden Perch*.

FAMILY PRISTIPOMATIDÆ.

MURRAYIA, Castelnau.

- M. Güntheri*, Castelnau, P.Z.S. Vict. I, p. 61, 1872.
 Macleay Cat. 121.
 Loc.—Murray R., Castelnau, l.c.
M. cyprinoides, Castelnau, P.Z.S. Vict. I, p. 62, 1872.
 Macleay Cat. 122.
 Loc.—Murray R., Castelnau, l.c.
 Vernacular name—*Murray Carp*.
M. bramaoides, Castelnau, P.Z.S. Vict. I, p. 63, 1872.
 Macleay Cat. 123.
 Loc.—Murray R., Castelnau, l.c.
 Vernacular name—*Murray Bream*.
M. riverina, Krefft, P.Z.S., p. 943, 1867.
 Macleay Cat. 124.
 Loc.—Murray and tributaries, Macleay, l.c.

(RIVERINA, Castelnau.)

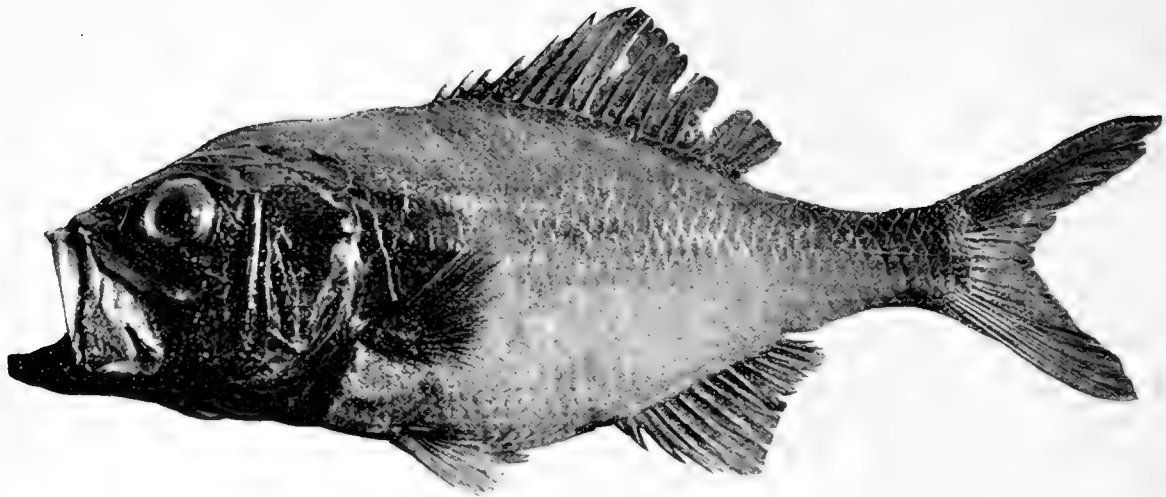
- (*R. fluvialis*, Castelnau, P.Z.S. Vict. I, p. 64, 1872.)
 Macleay Cat. 137.
 Loc.—One specimen, Murray R., Castelnau, l.c.

THERAPON, Cuvier.

- T. richardsoni*, Castelnau, P.Z.S. Vict. I, p. 60, 1872.
 Macleay Cat. 138.
 Loc.—Murray R., Castelnau, l.c.
 Vernacular name—*Murray Silver Perch*.
T. niger, Castelnau, P.Z.S. Vict. I, p. 59, 1872.
 Macleay Cat. 139.
 Loc.—Murray R., rare, Castelnau, l.c.
 Vernacular name—*Murray Black Perch*.

HISTIOPTERUS, Richardson.

- H. recurvirostris*, Richardson, Voy. Erebus and Terror,
 p. 34, 1846.
 Macleay Cat. 156.
 Vernacular name—*Boar-fish*.
H. labiosus, Günther, P.Z.S. p. 658, 1871.
 Macleay Cat. 157.
 Figured, P.Z.S. 1871, pl. 59.
 Loc.—Western Port and Port Phillip, Castelnau,
 P.Z.S. Vict. I, p. 112.



ROCK PERCH.

GERRES, Cuvier.

- G. melbournensis*, Castelnau, P.Z.S. Vict. I, p. 158, 1872
Macleay Cat. 173
Loc.—Victorian seas, Castelnau, l.c.

FAMILY NANDIDÆ.

RUTTELIA, Castelnau.

- R. prolongata*, Castelnau, P.Z.S. Vict. II, p. 51, 1873.
Macleay Cat. 218.
Loc.—Victorian seas, Castelnau, l.c.
Vernacular name—*Devil-fish* (Castelnau).

FAMILY MULLIDÆ.

UPENEIOIDES, Bleeker.

- U. flamengi*, Cuv. et Val., Poissons III, p. 452, 1829.
Günther Cat. I, p. 400; Macleay Cat. 222.
Figured, Cuv. et Val., l.c. pl. 71.
Loc.—Victorian seas, Castelnau, P.Z.S. Vict. II, p. 39
Vernacular name—*Red Mullet*.

UPENEICHTHYS, Bleeker.

- U. porosus*, Cuv. et Val., Poissons III, p. 455, 1829.
Günther Cat. I, p. 400; Macleay Cat. 227.
Loc.—Victorian seas; not very common
Vernacular name—*Red Gurnet, Red Mullet*.

FAMILY SPARIDÆ.

GIRELLA, Gray.

- G. tricuspidata*, Cuv. et Val., Poissons VI, p. 372, 1830.
Günther Cat. I, p. 428; Macleay Cat. 231.
Figured, Richardson, Voy. Erebus and Terror, pl. 25
Vernacular name—*Rock or Black Perch*.
G. simplex, Richardson, Voy. Erebus and Terror, p. 25, 1846.
Günther Cat. I, p. 429; Macleay Cat. 232.
Figured, McCoy, Prodr. Zool. Vict. pl. 73.
Loc.—Gippsland Lakes; not very uncommon in Port Phillip.
Vernacular name—*Ludrick*.
(*G. blackii*, Castelnau, P.Z.S. Vict. II, p. 41, 1873)
Macleay Cat. 234.
Loc.—“The specimen,” Castelnau, l.c.

NEOTEPHROGOPS, Castelnau.

- N. zebra*, Richardson, Voy. Erebus and Terror, p. 70, 1846.
Günther Cat. I, p. 432; Macleay Cat. 239.
Loc.—*Passim*.
Vernacular name—*Zebra-fish*.

PAGRUS, Cuvier.

- P. unicolor*, Cuv. et Val., Poissons VI, p. 162, 1830.
Günther Cat. I, p. 468; Macleay Cat. 255.
Loc.—Port Phillip, and off south coast.
Vernacular name—*Schnapper* or *Snapper*.

CHRYSOPHRYS, Cuvier.

- C. australis*, Günther Cat. I, p. 494, 1859.
Macleay Cat. 259.
Figured, McCoy, Prodr. Zool. Vict., pl. 4; Günther Cat. pl. 28.
Loc.—*Passim*.
Vernacular name—*Bream*.

(HAPLODACTYLUS, Cuv. et Val.)

- H. macandratius*, Solander (Richardson), T.Z.S. III, p. 83, 1849.
Macleay Cat. Sup. 1161.
Loc.—Hobson's Bay, Klunzinger, Archiv. f. Naturg., xxxviii.

FAMILY CIRRHITIDÆ.

CHIRONEMUS, Cuv. et Val.

- C. marmoratus*, Günther Cat. II, p. 76, 1860.
Macleay Cat. 263.
Loc.—Victorian seas, Castelnau, P.Z.S. Vict. I, p. 73.
Vernacular name—*Kelp-fish*.

CHILODACTYLUS, Cuvier.

- C. macropterus*, Richardson, P.Z.S. p. 62, 1850.
Günther Cat. II, p. 78; Macleay Cat. 267.
Syn.—*C. aspersus*, Richardson. (Johnston, Report of Royal Commission on Fisheries of Tasmania, 1883.)
Loc.—Off south coast, Castelnau, P.Z.S. Vict. I, p. 74.
C. nigricans, Richardson, P.Z.S. p. 63, 1850.
Günther Cat. II, p. 79; Macleay Cat. 269.
Loc.—*Passim*.
Vernacular name—*Butter-fish*.



SAILING BOAT WITH OTTER TRAWL.

CHILODACTYLUS, Cuvier - *continued*.

- C. carponemus*, Cuv. et Val. V, p. 362, 1830.
 Günther Cat. II, p. 78; Macleay Cat. 266.
 Figured, McCoy, Prodr. Zool. Vict., pl. 173, 174.
 Loc.—Port Phillip Heads, rare.
- C. gibbosus*, Richardson, T.Z.S. III, p. 102, 1849.
 Günther Cat. II, p. 84; Macleay Cat. 271.
 Figured, P.Z.S., 1850, pl. 2.
 Loc.—Victorian, Castelnau, P.Z.S. Vict. I, p. 75.
 Vernacular name—*Maypie Perch*.
- C. spectabilis*, Hutton, Fishes of N.Z., p. 8, 1872.
 Macleay Cat. 272.
 Loc.—Port Phillip, Macleay, l.c.
- (*C. nebulosus*, Klünzinger, Archiv. f. Naturg., xxxviii, 1872.)
 Macleay Cat. Sup. 1164.
 Loc.—Queenscliff, Port Phillip, Klünzinger, l.c.

LATRIS, Richardson.

- L. hecatei*, Richardson, P.Z.S., p. 99, 1839.
 Günther Cat. II, p. 86; Macleay Cat. 276.
 Figured, T.Z.S. III, pl. 6.
 Loc.—Bass Straits, occasionally in Hobson's Bay, Castelnau, P.Z.S. Vict. I, p. 77.
 Vernacular name—*Hobart Town Trumpeter*.
- L. forsteri*, Castelnau, P.Z.S. Vict. I, p. 77, 1872.
 Macleay Cat. 278.
 Loc.—"Said to be common on Gippsland coast," Castelnau, l.c.
 Vernacular name—*Bastard Trumpeter*.

LATRIS, Richardson—*continued*.

- (*L. bilineata*, Castelnau, P.Z.S. Vict. I, p. 79, 1872.
 Macleay Cat. 279.
 Loc.—One specimen from Western Port, Castelnau, l.c.
- (*L. inornata*, Castelnau, P.Z.S. Vict. I, p. 79, 1872.)
 Macleay Cat. 280.
 Loc.—One specimen from Western Port, Castelnau, l.c.

(LACEPEDIA, Castelnau.)

- (*L. cataphracta*, Castelnau, P.Z.S. Vict. II, p. 43, 1873.)
 Macleay Cat. 281.
 Loc.—One specimen, stuffed, Castelnau, l.c.

FAMILY SCORPENIDÆ.

SEBASTES, Cuv. et Val.

- S. percooides*, Richardson, Voy. Erebus and Terror, p. 23, 1846.
 Günther Cat. II, p. 101; Macleay Cat. 282.
 Figured, Voy. Erebus and Terror, pl. 15; McCoy, Prodr. Zool. Vict., pl. 33.
 Loc.—Port Phillip, Macleay, l.c.
 Vernacular name—*Gurnet*.
- S. allporti*, Castelnau, P.Z.S. Vict. II, p. 40, 1873.
 Macleay Cat. 283.
 Loc.—Victorian seas, Castelnau, l.c.



SALMON TROUT.

SCORPÆNA, Artedi.

S. cruenta, Solander, A.M.N.H., IX, p. 217, 1842.

Günther Cat. II, p. 112; Macleay Cat. 284.

Syn.—*S. militaris*, Richardson, Voy. Erebus and Terror, p. 22.

Loc.—Port Phillip, Macleay, l.c.

Vernacular name—*Red Rock Cod*.

CENTROPOGON, Günther.

C. scorpanoides, Guichenot, Mém. Soc. Imp. des Sci. Nat., Cherbourg.

Macleay Cat. 298.

Syn.—*C. australis*, Castelnau, P.Z.S. Vict. I, p. 81.

Vernacular name—*Gurnot*.

PENTAROG, Günther.

P. marmorata, Cuv. et Val., Poissons IV, p. 416, 1829.

Günther Cat. II, p. 132; Macleay Cat. 300.

FAMILY TEUTHIDÆ.

TEUTHIS, Linnaeus.

T. janus, L. Syst. Nat. I, p. 507.

Günther Cat. III, p. 315; Macleay Cat. 306.

Loc.—Hobson's Bay, Macleay, l.c.

DIVISION II.—ACANTHOPTERYGII BERYCIFORMES.

None recorded.

DIVISION III.—ACANTHOPTERYGII KURTIFORMES.

None recorded.

DIVISION IV.—ACANTHOPTERYGII POLYNEMIFORMES.

None recorded.

DIVISION V.—ACANTHOPTERYGII SCLENIFORMES.

FAMILY SCLENIDÆ.

SCLENA, Cuv.

S. antarctica, Castelnau, P.Z.S. Vict. I, p. 100, 1872.

Macleay Cat. 329.

Syn.—Probably, *Corvina antarctica*, Steindachner, Sitzungs. ak. Wiss. Wien, 1866.

Loc.—Occasional visitor in Bass Straits, Castelnau, l.c.

Vernacular name—*King fish*.

DIVISION VI.—ACANTHOPTERYGII XIPHIIFORMES.

None recorded.

DIVISION VII.—ACANTHOPTERYGII TRICHIURIFORMES.

FAMILY TRICHIURIDÆ.

THYRSITES, Cuv. et Val.

T. atun, Cuv. et Val., Poissons VIII, p. 196, 1831.

Günther Cat. II, p. 350; Macleay Cat. 336.

Syn.—*Scomber atun*, Vetensk. Acad. xii; *T. altivelis*, Richardson, P.Z.S., 1839.

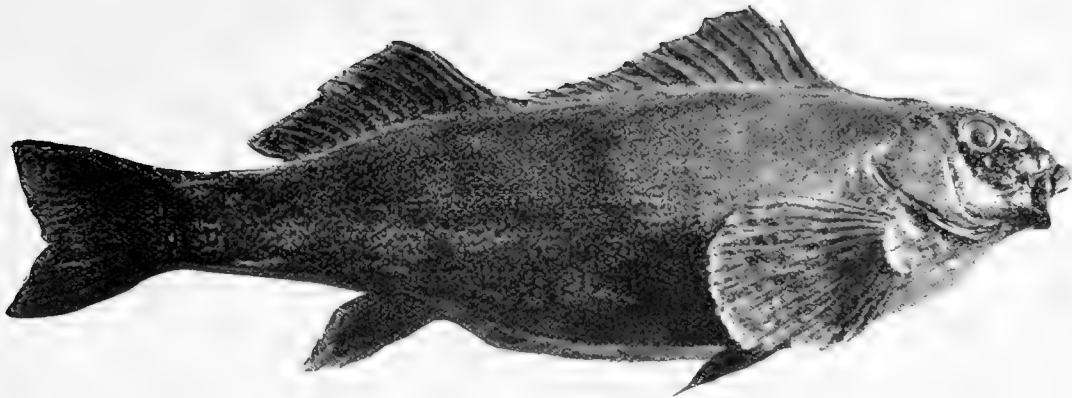
Figured, Cuv. et Val., Poissons, pl. 219; McCoy, Prodr. Zool. Vict., pl. 44.

Loc.—Off south coast; Bass Straits.

Vernacular name—*Barracouta* or *Barracoota*.



HAMMERHEADED SHARK.



BUTTERFISH.

DIVISION VIII.—ACANTHOPTERYGII COTTOSCOMBRIFORMES

FAMILY CARANGIDÆ.

TRACHURUS, Cuv. et Val.

- T. trachurus*, Cuv. et Val., Poissons IX, p. 11, 1833.
 Günther Cat. II, p. 419; Macleay Cat. 347.
 Syn.—*Caranx declivis*, Jenyns, Zool. Beagle Fish, p. 68, pl. 14; *Scomber trachurus*, Lin. Syst. Nat. i, p. 494.
 Figured, Cuv. et Val., pl. 246; McCoy, Prodr. Zool. Vict., pl. 18.
 Loc.—Port Phillip, McCoy.
 Vernacular name—*Horse Mackerel*.

CARANX, Cuv. et Val.

- C. Georgianus*, Cuv. et Val., Poissons IX, p. 85, 1833.
 Günther Cat. II, p. 440; Macleay Cat. 350.
 Figured, Voy. Erebus and Terror, pl. 58.
 Loc.—Port Phillip, and off south coast.
 Vernacular name—*Silver Trevally*.

SERIOLA, Cuvier.

- S. lalandi*, Cuv. et Val., Poissons V, p. 208, 1830.
 Günther Cat. 463; Macleay Cat. 365, 368.
 Syn.—*S. grandis*, Castelnau, P.Z.S. Vict. I, p. 115.
 Figured, McCoy, Prodr. Zool. Vict. pl. 172.
 Vernacular name—*Yellow Tail* or *King-fish*.

NEPTONEMUS, Günther.

- N. travale*, Castelnau, P.Z.S. Vict. I, p. 118, 1872.
 Macleay Cat. 372.
 Vernacular name—*Trevally*.

TEMNODON, Cuv. et Val.

- T. saltator*, Bl. syst. Ichthyol. (Schneider), p. 35, 1801.
 Günther Cat. II, p. 479; Macleay Cat. 375.
 Loc.—Queenscliff.
 Vernacular name—*Skipjack*.

(PAREQUULA, Steindachner.) (?)

- (*P. bicornis*, Steindachner, Sitzungs. ak. Wein, 1867.)
 Macleay Cat. Sup., p. 25.
 Loc.—Hobson's Bay. Requires confirmation.

FAMILY CYTTIDÆ.

ZEUS, Cuvier.

- Z. australis*, Richardson, Voy. Erebus and Terror, p. 136, 1846.
 Macleay Cat. 386.
 Syn.—Günther considers = *Z. faber*, L., Cat. II, p. 393.
 Vernacular name—*Southern John Dorey*.

CYTTUS, Günther.

- C. australis*, Richardson sp., Voy. Erebus and Terror, p. 137, 1846.
 Günther Cat. II, p. 396; Macleay Cat. 387.
 Syn.—*Capros australis*, Richardson, l.c.
 Loc.—Hobson's Bay, McCoy, Rep. Intercol. Exh., 1866.
 Vernacular name—*Bastard Dorey*.

FAMILY CORYPHENIDÆ.

BRAMA, Risso.

- B. raii*, Bloch, Syst. Ichth. (Schneider), p. 99, 1801.
 Günther Cat. II, p. 408; Macleay Cat. 389.
 Figured, McCoy, Prodr. Zool. Vict., pl. 133.
 Loc.—Portland, 1884, McCoy, l.c.
 Vernacular name—*Ray's Sea Bream*.

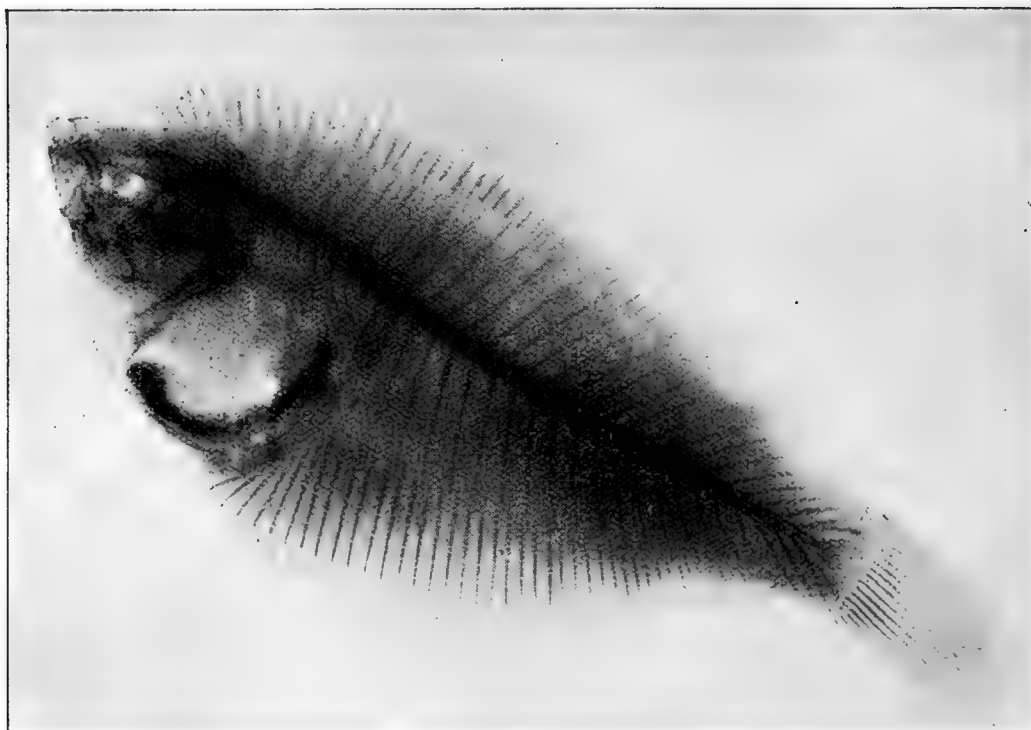
FAMILY SCOMBRIDÆ.

SCOMBER, Artedi

- S. australasicus*, Cuv. et Val., Poissons VIII., p. 36, 1831.
 Günther Cat. II, p. 359; Macleay Cat. 392.
 Syn.—*S. pneumatophorus*, De la Roche (McCoy).
 Figured, McCoy, Prodr. Zool. Vict., pl. 28.
 Loc.—Rarely in Hobson's Bay, in considerable numbers when it does appear; McCoy, l.c.
 Vernacular name—*Southern Mackerel*.
 (*S. antarcticus*, Castelnau, P.Z.S., Vict. I, p. 106, 1872.)
 Macleay Cat. 393.
 Loc.—One specimen seen in Melbourne market, Castelnau.
 (*S. jancsaba*, Bleeker, Japan, p. 406, 1858.)
 Günther Cat. I, p. 359; Macleay, Cat. Sup. 1186.
 Loc.—Hobson's Bay, Klünzinger.
 (*S. tapinocephalus*, Bleeker, Japan, p. 407, 1858.)
 Günther Cat. II, p. 361; Macleay Cat. Sup. 1188.
 Loc.—Hobson's Bay, Klünzinger.

THYNNUS, Cuv. et Val.

- T. mccoyi*, Castelnau, P.Z.S. Vict. I, p. 104, 1872.
 Macleay, Cat. 396.
 Syn.—*T. thynnus* L. (McCoy).
 Figured, McCoy, Prodr. Zool. Vict. pl. 44.
 Loc.—Hobson's Bay, Portland, Bass Straits, Queenscliff, McCoy, l.c.
 Vernacular name—*Tunny*.



FLOUNDER TAKEN BY RÖNTGEN PROCESS BY DR. CLENDINNEN, ARMADALE.

(PELAMYS, Cuv. et Val.)

- (*P. schlegelii*, McCoy, Prodr. Zool. Vict. 1888)
 Syn.—Perhaps *P. orientalis*, Schlegel (McCoy).
 Figured, McCoy, Prodr. Zool. Vict. pl. 155.
 Loc.—Only one specimen caught in Port Phillip Bay, 1877, McCoy, l.c.

(CYBIUM, Cuv.)

- (*C. commersonii*, Lacép. Hist. des Poissons II, p. 600, 1800.)
 Günther Cat. II, p. 370; Macleay Cat. 400.
 Figured, McCoy, Prodr. Zool. Vict. pl. 154.
 Loc.—Only one specimen caught near Queenscliff, 1887, McCoy, l.c.
 Vernacular name—*Commerson's Mackerel*.

FAMILY TRACHINIDÆ.

KATHIETOSTOMA, Günther.

- K. leve*, Bloch, Syst. Ichth. (Schneider), p. 47, 1801.
 Günther Cat. II, p. 231; Macleay Cat. 406.
 Figured, Bloch, l.c., pl. 8.
 Vernacular name—*Stone-lifter*.

(PSEUDAPHRITIS, Castelnau.)

- (*P. bassii*, Castelnau, P.Z.S. Vict. I, p. 92, 1872.)
 Macleay Cat. 411.
 Loc.—One specimen taken in Bass Straits, Castelnau.

SILLAGO, Cuv.

- S. punctata*, Cuv. et Val., Poissons III, p. 413, 1829.)
 Günther Cat. II, p. 245; Macleay Cat. 413.
 Figured, Voyage Astrolabe, pl. 1.
 Loc.—*Passim*.
 Vernacular name—*Melbourne Whiting*.

SILLAGO, Cuv.—*continued*.

- (*S. maculata*, Quoy et Gaim., Exp. Freycinet Zool., p. 261, 1834.)
 Günther Cat. II, p. 245; Macleay Cat. 412.
 Figured, Q. et G., l.c., pl. 53.
 Loc.—Seen only once, Castelnau, P.Z.S. Vict. I, p. 94.

(BOVICHTHYS, Cuv. et Val.)

- (*B. variegatus*, Richardson, Voy. Erebus and Terror, p. 56, 1846.)
 Günther Cat. II, p. 250; Macleay Cat. 419.
 Figured, Voy. Erebus and Terror, pl. 34.
 Loc.—One dried specimen from Hobson's Bay, Castelnau, P.Z.S. Vict. II, p. 45.

FAMILY PEDICULATI.

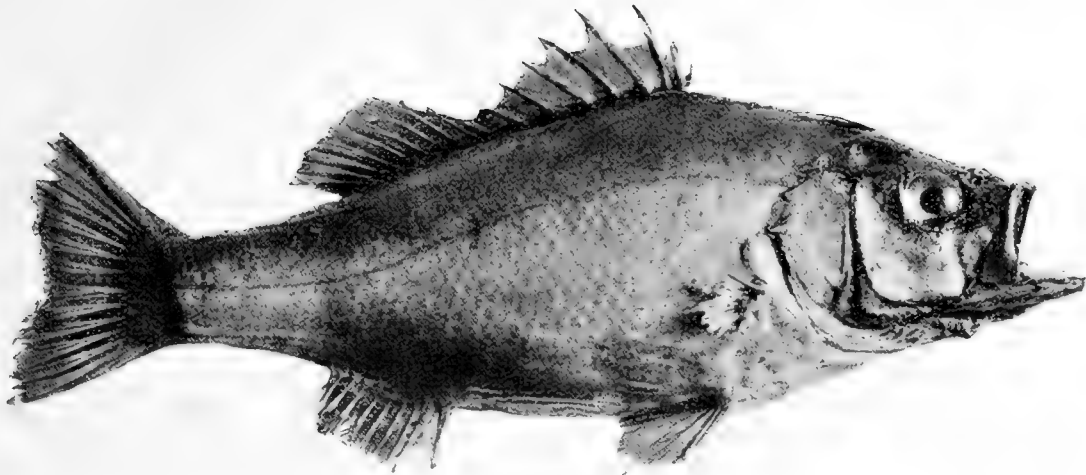
CHIRONECTES, Cuvier.

- C. bifurcatus*, McCoy, Prodr. Zool. Vict., Decade 13, 1886.
 Figured, McCoy, Prodr. Zool. Vict., pl. 123.
 Loc.—Port Phillip, McCoy, l.c.

FAMILY COTTINÆ.

PLATYCEPHALUS, Bl.

- (*P. speculator*, Klünzinger, Archiv. f. Naturg., 1872.)
 Macleay, Cat. Sup. 1197.
 Loc.—Hobson's Bay, Klünzinger.
P. bassensis, Cuv. et Val., Poissons IV, p. 247, 1829.
 Günther Cat. II, p. 1879; Macleay Cat. 444.
 Syn.—*P. tasmanius*, Richardson, Voy. Erebus and Terror, p. 23.
 Figured, Voy. Erebus and Terror, pl. 18.
 Loc.—Port Phillip.
 Vernacular name—*Flathead*.



MURRAY PERCH.

PLATYCEPHALUS, Bl.—continued.

- P. fuscus*, Cuv. et Val., Poissons IV, p. 241, 1829.
Macleay, Cat. 445.
Figured, Voy. Astrolabe, pl. 10.
Loc.—Port Phillip.
Vernacular name—*Grass Flathead*.
P. lavigatus, Cuv. et Val., Poissons IV, p. 243, 1829.
Günther Cat. II, p. 179; Macleay Cat. 446.
Loc.—Port Phillip, Western Port.
Vernacular name—*Rock Flathead*.
(*P. proximus*, Castelnau, P.Z.S. Vict. I, p. 85, 1872.)
Macleay Cat. 447.
Loc.—Only seen once in Melbourne market, Castelnau, l.c.
P. richardsoni, Castelnau, P.Z.S. Vict. I, p. 82, 1872.
Macleay Cat. 448.
P. grandis, Castelnau sp., P.Z.S. Vict. I, p. 87, 1872.
Macleay Cat. 457.
Syn.—*Neoplatycephalus grandis*, Castelnau, l.c.

LEPIDOTRIGLA, Günther.

- (*L. phalena*, Cuv. et Val., Poissons IV, p. 83, 1829.)
Günther Cat. II, p. 197; Macleay Cat. 459.
Loc.—Melbourne, Günther (quoted by Macleay, l.c.)
(*L. sphynx*, Cuv. et Val., Poissons, IV, p. 83, 1829.)
Günther Cat. II, p. 197; Macleay Cat. 460.
Loc.—One specimen, Castelnau, P.Z.S. Vict. I, p. 89.
L. vanessa, Richardson, Trans. Z.S. III, 1849.
Günther Cat. II, p. 197; Macleay Cat. 461.
Figured, McCoy, Prodr. Zool. Vict., pl. 5.
Loc.—Hobson's Bay.
Vernacular name—*Butterfly Gurnard*.

TRIGLA, Artedi.

- T. kumu*, Less. and Garn., Voy. de la Coquille, Poissons, pl. 19, 1826-30.
Günther Cat. II, p. 204; Macleay Cat. 463.
Figured, McCoy, Prodr. Zool. Vict., pl. 6.
Loc.—Hobson's Bay, McCoy, l.c.
Vernacular name—*Kumu Gurnard*.
T. polyommata, Richardson, T.Z.S. III, p. 96, 1839.
Günther Cat. II, p. 204; Macleay Cat. 464.
Figured, Richardson, T.Z.S. III, pl. 5.
Vernacular name—*Flying Gurnard*.

DIVISION IX.—ACANTHOPTERYGII Gobiiformes.

FAMILY Gobiidae.

GOBIUS, Artedi.

- (*G. bifrenatus*, Kner., Voy. Novara, Fishes, p. 177, 1868.)
Macleay Cat. 476.
Syn.—*G. bassensis*, Castelnau, P.Z.S. Vict. I, p. 123.
Figured, Voy. Novara, pl. 7.
Loc.—Only seen once, Castelnau, l.c.
G. castelnaui, Macleay Cat. 477, 1881.
Loc.—Hobson's Bay, Castelnau, l.c., p. 124.
(*G. pictus*, Castelnau, P.Z.S. Vict. I, p. 124, 1872.)
Macleay Cat. 479.
Loc.—One specimen, Castelnau, l.c., p. 124.
G. pulchellus, Castelnau, P.Z.S. Vict. I, p. 125, 1872.
Macleay Cat. 481.
Loc.—Western Port, Castelnau, l.c.
(*G. caudatus*, Castelnau, P.Z.S. Vict. II, p. 47, 1873.)
Macleay Cat. 481.
Loc.—Apparently only one specimen. See Castelnau, l.c.
(*G. nebulo-punctatus*, Cuv. et Val., Poissons XII, p. 58, 1837.)
Günther Cat. III, p. 26; Macleay Cat. Sup. 1203.
Loc.—King George's Sound and Victoria, Klunzinger.

ELEOTRIS, Gronov.

- E. nudiceps*, Castelnau, P.Z.S. Vict. I, p. 126, 1872.
Macleay Cat. 520.
Loc.—Very common in Lower Yarra, Castelnau, l.c.
Vernacular name—*Big-head*, Castelnau.
(*E. cyprinoides*, Cuv. et Val., Poissons XII, p. 248, 1837.)
Günther Cat. III, p. 118; Macleay Cat. Sup. 1206.
Figured, Klunzinger, Sitzb. k. Ak. Wiss., Wien., 1879, pl. 5.
Loc.—Murray River, Klunzinger, l.c.

CALLIONYMUS, L.

- (*C. calauropomus*, Richardson, Voy. Erebus and Terror, p. 10, 1846.)
Günther Cat. III, p. 147; Macleay Cat. 540.
Figured, Voy. Erebus and Terror, pl. 7.
Loc.—One specimen from Hobson's Bay, Castelnau, P.Z.S. Vict. II, p. 49.



HOLEXENUS CUTANEUS.

CALLIONYMUS, L.—continued.

- C. papilio*, Günther, A.M.N.H. XIV, p. 197, 1864.
Macleay Cat. 541.
Syn.—*C. ocellifer*, Castelnau, P.Z.S. Vict. II, p. 49.
Loc.—Hobson's Bay, Castelnau.

DIVISION X.—ACANTHOPTERYGII BLENNIIFORMES.

FAMILY BLENNIIDÆ.

(SALARIAS, Cuv. et Val.)

- (*S. mulleri*, Klünzinger, Sitzb. d. k. Ak. Wiss., Wien., p. 388, 1879.)
Macleay Cat. Sup. 1215.
Loc.—Hobson's Bay, Klünzinger, l.c.

CLINUS, Cuv.

- C. despicillatus*, Richardson, Zool. Journ., p. 190, 1839.
Günther Cat. III, p. 271; Macleay Cat. 572.
Figured, T.Z.S. III, pt. 6.
Loc.—Recorded as Victorian by Castelnau, P.Z.S. Vict. I, p. 129.
(*C. marmoratus*, Klünzinger, Archiv. f. Naturg., 1872.)
Macleay Cat. Sup. 1217.
Loc.—Port Phillip, Klünzinger, l.c.

CRISTICEPS, Cuv. et Val.

- C. howittii*, Castelnau, P.Z.S. Vict. II, p. 48, 1873.
Macleay Cat. 582.
Loc.—Western Port, Castelnau, l.c.
C. robustus, Günther, A.M.N.H. XX, p. 62, 1867.
Macleay Cat. 583.
Loc.—Melbourne, Günther, l.c.
C. multifinestratus, Castelnau, P.Z.S. Vict. I, p. 131, 1872; II, p. 48, 1873.
Macleay Cat. 586.
(*C. amarus*, Castelnau, P.Z.S. Vict. II, p. 48, 1873.)
Macleay Cat. 587.
Loc.—One specimen, Victorian, Castelnau, l.c.
(*C. forsteri*, Castelnau, P.Z.S. Vict. I, p. 132, 1872.)
Macleay Cat. 588.
Loc.—One specimen, Melbourne, Castelnau, l.c.
(*C. tristis*, Klünzinger, Archiv. f. Naturg., 1872.)
Macleay Cat. Sup. 1218.
Loc.—Murray R., Klünzinger, l.c.

DIVISION XI.—MUGILIFORMES.

FAMILY SPHYRÆNIDÆ.

SPHYRÆNA, Artedi.

- S. nova hollandiae*, Günther Cat. II, p. 335, 1860.
Macleay Cat. 603.
Loc.—*Passim*.
Vernacular name—*Pike*.

LANIOPERCA, Günther.

- L. mordax*, Günther, A.M.N.H., X, p. 183, 1872.
Macleay Cat. 608.
Syn.—*Dinolestes mülleri*, Klünzinger; *Neosphyrena multiradiata*, Castelnau.
Figured, McCoy, Prodr. Zool. Vict., pl. 115.
Loc.—Port Phillip.

FAMILY ATHERINIDÆ.

ATHERINICHTHYS, Bleeker.

- A. modesta*, Castelnau, P.Z.S. Vict. I, p. 136, 1872.
Macleay Cat. 620.
Loc.—Hobson's Bay and Lower Yarra, Castelnau
A. picta, Castelnau, P.Z.S. Vict. I, p. 137, 1872,
Macleay Cat. 622.
Loc.—Capt. Synnot's Dock, Lower Yarra, Castelnau.
A. cephalotes, Castelnau, P.Z.S. Vict. I, p. 137, 1872.
Macleay Cat. 623.
Loc.—Hobson's Bay, Castelnau.

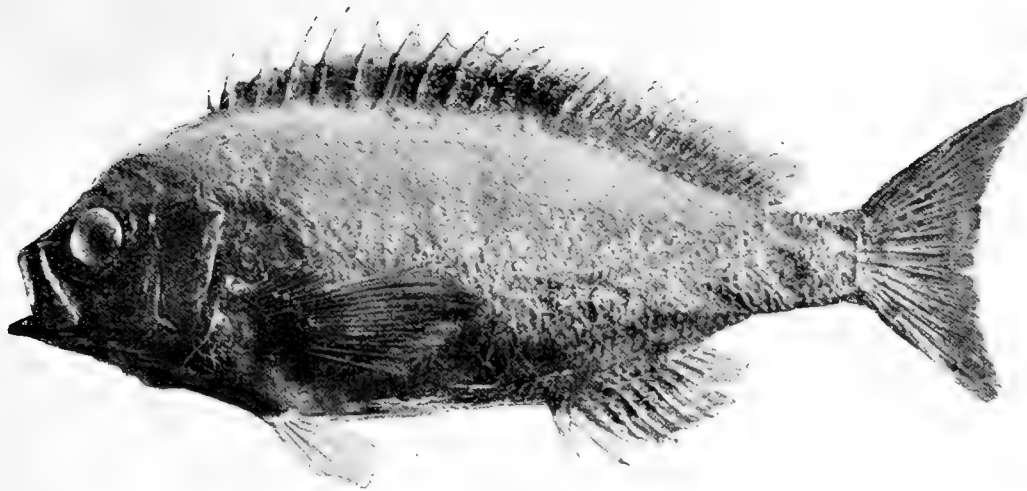
(ATHERINOSOMA, Castelnau.)

- (*A. vorax*, Castelnau, P.Z.S. Vict. I, p. 138, 1872.)
Macleay Cat. 627.
Loc.—One specimen from Cape Schanck, Castelnau, l.c.

FAMILY MUGILIDÆ.

MUGIL, Artedi.

- (*M. peronii*, Cuv. et Val., Poissons II, p. 138, 1836.)
Macleay Cat. 635.
Loc.—One specimen from Western Port, Castelnau,
P.Z.S. Vict. II, p. 151.
M. grandis, Castelnau, P.L.S. N.S.W. III, p. 386,
1879.
Macleay Cat. 629.
Loc.—*Passim*.
Vernacular name—*Sand Mullet*.
(*M. gelatinosus*, Klünzinger, Archiv. f. Naturg., 1872.)
Macleay Cat. Sup. 1225.
Loc.—Hobson's Bay, Klünzinger, l.c.



THE LUDRICK.

AGONOSTOMA, Günther.

A. diemensis, Richardson, Zool. Trans. III, p. 123, 1849.

Günther Cat. III, p. 465; Macleay Cat. 641.

Syn.—*A. forsteri*, Bleeker.

Loc.—*Passim*.

Vernacular name—*Mullet*.

A. lacustris, Castelnau, P.Z.S. Vict. I, p. 142, 1872.

Macleay Cat. 642.

Loc.—Gippsland Lakes.

MYXUS, Günther.

M. elongatus, Günther, P.L.S. N.S.W. IV, p. 426, 1879.

Günther Cat. III, p. 466; Macleay Cat. 643.

Loc.—Hobson's Bay, Günther, l.c.

DIVISION XII.—ACANTHOPTERYGII GASTEROSTEIFORMES.

None recorded.

DIVISION XIII.—ACANTHOPTERYGII CENTRISCIFORMES.

None recorded.

DIVISION XIV.—ACANTHOPTERYGII GOBIESOCIFORMES.

None recorded.

DIVISION XV.—ACANTHOPTERYGII CHANNIFORMES.

None recorded.

DIVISION XVI.—ACANTHOPTERYGII TENIIFORMES.

FAMILY TRACHYPTERIDÆ.

(REGALECUS, Brünn.)

(*R. banksii*, Cuv. et Val., Poissons, X, p. 365, 1835.)

Günther Cat. III, p. 309.

Figured, McCoy, Prodr. Zool., pl. 145.

Loc.—Bass Straits, one specimen, McCoy, l.c.

Vernacular name—*Oar Fish*; probably *Sea Serpent*, McCoy.

TRACHYPTERUS, Gouan.

T. tenia, Bl. Schn., p. 480, 1801.

Günther Cat. III, p. 302.

Figured, McCoy, Prodr. Zool. Vict., pl. 122.

Loc.—Portland, McCoy.

DIVISION XVII.—ACANTHOPTERYGII NOTACANTHIFORMES.

None recorded.

ORDER ACANTHOPTERYGII PHARYNGOGNATHI.

FAMILY POMACENTRIDÆ.

GLYPHISODON, Cuvier.

G. victoria, Günther, A.M.N.H. II, p. 116, 1862 (XI, 1873, p. 115).

Macleay Cat. 676.

Vernacular name—*Rock Perch*.

FAMILY LABRIDÆ.

LABRICHTHYS, Bleeker.

Vernacular name—*Wrasses*, or *Parrot-fish*.

(*L. psittacula*, Richardson, P.Z.S., p. 26, 1840.)

Günther Cat. IV, p. 114; Macleay Cat. 696.

Figured, Voy. Erebus and Terror, pl. 56; Günther Cat. pl. 59.

Loc.—Only one specimen, Castelnau, P.Z.S. Vict. II, p. 52.

L. laticlavius, Richardson, Voy. Erebus and Terror, p. 128, 1846.

Günther Cat. IV, p. 115; Macleay Cat. 698.

Figured, McCoy, Prodr. Zool. Vict., pl. 163.

Loc.—Hobson's Bay, McCoy, l.c.

L. bleekeri, Castelnau, P.Z.S., Vict. I, p. 148, 1872.

Macleay Cat. 705.

Figured, McCoy, Prodr. Zool. Vict., pl. 134.

Loc.—Port Phillip.

L. richardsoni, Castelnau, P.Z.S. Vict. I, p. 150, 1872.

Macleay Cat. 706.

Loc.—Port Phillip.

L. ephippium, Günther A.M.N.H. XI, p. 116, 1863.

Macleay Cat. 707.

Syn.—*L. vestita*, Castelnau, P.Z.S. Vict. I, p. 151, 1872.

Loc.—Port Phillip.

(*L. curieri*, Castelnau, P.Z.S. Vict. II, p. 53, 1873.)

Macleay Cat. 708.

Loc.—One specimen, Phillip Island, Castelnau, l.c.

(HETEROSCARUS, Castelnau.)

(*H. macleayi*, McCoy, Prodr. Zool. Vict., Decade 17, 1888.)

Figured, McCoy, Prodr. Zool. Vict., pl. 164.

Loc.—One specimen from Portland, McCoy, l.c.



ODAX, Cuv. et. Val.

O. richardsoni, Günther Cat. IV, p. 241, 1862.

Günther Cat. IV, p. 241; Macleay Cat. 753.

Loc.—*Passim*.

Vernacular name—*Stranger*.

O. obscurus, Castelnau, P.Z.S. Vict. I, p. 154, 1872.

Macleay Cat. 756.

OLISTHEROPS, Richardson.

O. cyanomelas, Richardson, A.M.N.H., p. 291, 1851.

Günther Cat. IV, p. 243; Macleay Cat. 760.

ORDER ANACANTHINI.

FAMILY GADOPSIDÆ.

GADOPSIS, Richardson.

G. marmoratus, Richardson, Voy. Erebus and Terror, p. 122, 1846.

Günther, Cat. 4, p. 318; Macleay Cat. 763.

Figured, Voy. Erebus and Terror, pl. 59.

Loc.—*Passim*, Victorian streams, especially south of Dividing Range.

Vernacular name—*Black-fish*.

FAMILY GADIDÆ.

LOTELLA, Kaup.

L. callarias, Günther, A.M.N.H., p. 116, 1863.

Macleay Cat. 766.

Figured, McCoy, Prodr. Zool. Vict., pl. 19.

Loc.—Port Phillip, McCoy, l.c.

Vernacular name—*Small-scaled Rock Cod*.

PSEUDOPHYCIS, Günther.

P. barbatus, Günther, A.M.N.H., p. 116, 1863.

Macleay Cat. 769.

Figured, McCoy, Prodr. Zool. Vict., pl. 20.

Loc.—*Passim*.

Vernacular name—*Rock Cod*.

(PHYSICULUS, Kaup.)

(*P. palmatus*, Klünzinger, Archiv. f. Naturg., xxxviii, 1872.)

Macleay Cat. Sup. 1244

Loc.—Port Phillip, Klünzinger.

FAMILY OPHIDIIDÆ.

GENYPTERUS, Philippi.

G. australis, Castelnau, P.Z.S., Vict. I, p. 164, 1872.

Macleay Cat. 771.

Syn.—*G. tigrinus*, Klünzinger, Archiv. f. Naturg., 1872

Figured, McCoy, Prodr. Zool. Vict., pl. 27.

Loc.—*Passim*.

Vernacular name—*Rockling*.

FAMILY PLEURONECTIDÆ.

(PSEUDORHOMBUS, Bleeker.)

(*P. mulleri*, Klünzinger, Archiv. f. Naturg., xxxviii, 1872.)

Macleay Cat. Sup. 1247.

Loc.—Hobson's Bay, Klünzinger, l.c.

RHOMBOSOLEA, Günther.

R. fiesoides, Günther, A.M.N.H. II, p. 117, 1863.

Macleay Cat. 788.

Loc.—Port Phillip, Günther.

R. bassensis, Castelnau, P.Z.S. Vict. I, p. 167, 1872.

Macleay, Cat. 789.

Loc.—*Passim*.

Vernacular name—*Sole*.

R. victorice,* Castelnau sp., P.Z.S. Vict. I, p. 168, 1872.

Macleay Cat. 790.

Loc.—*Passim*.

Vernacular name—*Flounder*.

ORDER IV.—PHYSOSTOMI.

FAMILY SILURIDÆ.

COPIDOGLANIS, Günther.

C. tandanus, Mitchell Exp. I, p. 95, 2nd ed., 1839.

Günther Cat. V, p. 26; Macleay Cat. 806.

Figured, Mitchell Exp., pl. 6.

Loc.—Murray R. and tributaries.

Vernacular name—*Murray Cat-fish*.

FAMILY HAPLOCHITONIDÆ.

PROTOTROCTES, Günther.

P. marana, Günther Cat. V, p. 382, 1864.

Macleay Cat. 824.

Loc.—Southern rivers of Victoria, formerly in Yarra.

Vernacular name—*Yarra Herring*.

FAMILY SCOPELIDÆ.

AULOPUS, Cuv.

A. purpurissatus, Richardson, Icon. Pisc., p. 6, 1843.

Günther Cat. V, p. 403; Macleay Cat. 832.

Figured, McCoy, Prodr. Zool. Vict., pl. 54, 55.

Loc.—Hobson's Bay, McCoy, l.c.

Vernacular name—*Sergeant Baker* (at Sydney).

FAMILY GALAXIDÆ.

GALAXIAS, Cuv.

G. attenuatus, Jenyns, Zool. Beagle, Fishes, p. 121, 1842.

Günther Cat. VI, p. 210; Macleay Cat. 843.

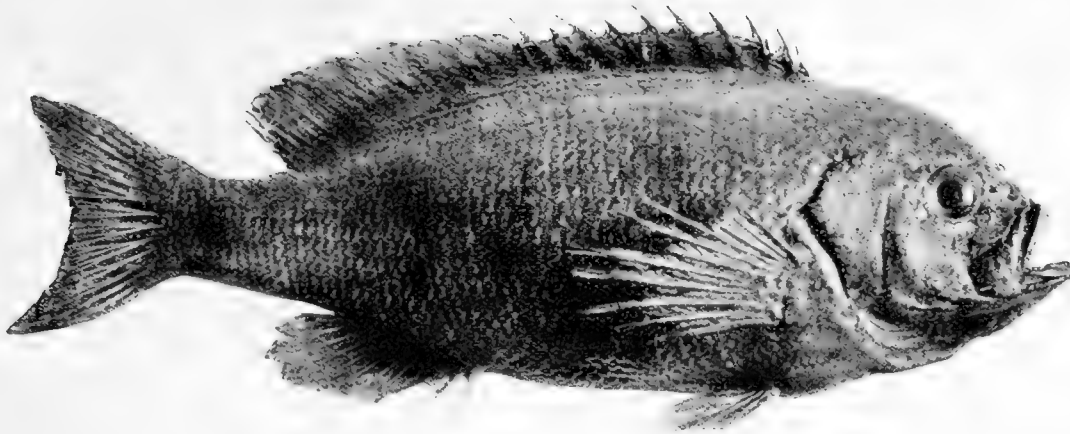
Figured, Zool. Beagle, pl. 22.

Syn.—*G. scriba*, Richardson, Voy. Erebus and Terror, p. 75; *G. maculatus*, Richardson, Voy. Erebus and Terror, p. 76.

Loc.—Very common in Lower Yarra, Castelnau, P.Z.S. Vict. I, p. 177.

Vernacular name—*Yarra Gudgeon*.

* NOTE.—Prof. McCoy considers *R. victorice*, Castelnau = *R. fiesoides*, Günther.



GALAXIAS, Cuv.—continued.

- G. ocellatus*, McCoy, Internat. Exch. Essays, p. 14, 1866-7.
 Macleay Cat. 852.
 Loc.—R. Yarra.
 Vernacular name—*Yarra Trout*.
G. cylindricus, Castelnau, P.Z.S. Vict. I, p. 177, 1872.
 Macleay Cat. 853.
 Loc.—R. Yarra, Castelnau, l.c.
G. delicatulus, Castelnau, P.Z.S. Vict. I, p. 178, 1872.
 Macleay Cat. 854.
 Loc.—R. Yarra, Castelnau, l.c.
G. amoenus, Castelnau, P.Z.S. Vict. I, p. 178, 1872.
 Macleay Cat. 855.
 Loc.—R. Yarra, Castelnau, l.c.
(G. versicolor, Castelnau, P.Z.S. Vict. I, p. 176, 1872.)
 Macleay Cat. 856.
 Loc.—One specimen from marsh near St. Kilda, Castelnau, l.c.
G. ornatus, Castelnau, P.Z.S. Vict. II, p. 153, 1873.
 Macleay Cat. 857.
 Loc.—Cardinia Creek, Castelnau.
(G. rostratus, Klünzinger, Archiv. f. Naturg., p. 41, 1872.)
 Macleay Cat. Sup. 1265.
 Loc.—Murray R., Klünzinger, l.c.
(G. obtusus, Klünzinger, Archiv. f. Naturg., p. 41, 1872.)
 Loc.—Yarra Lagoon, Klünzinger, l.c.

FAMILY SCOMBRESOCIDÆ.

SCOMBRESOX, Lacép.

- S. forsteri*, Cuv. et Val. XVIII, p. 481, 1846.
 Günther Cat. VI, p. 258; Macleay Cat. 866.
 Syn.—*S. saurus* (Bloch sp.), var. *forsteri* (Cuv. et Val.), according to McCoy.
 Figured, McCoy, Prodr. Zool. Vict., pl. 135.

HEMIRAMPHUS, Cuvier.

- H. intermedius*, Cant., A.M.N.H. IX, p. 485, 1842.
 Günther Cat. VI, p. 260; Macleay Cat. 867.
 Syn.—*H. melanochir*, Cuv. et Val.
 Figured, McCoy, Prodr. Zool. Vict. pl. 135.
 Vernacular name—*Gar-fish*.

FAMILY CYPRINIDÆ.

NEOCARASSIUS, Castelnau.

- N. ventriosus*, Castelnau, P.Z.S., Vict. I, p. 237, 1872.
 Macleay Cat. 881.
 Loc.—Saltwater R., Castelnau, l.c.

FAMILY GONORHYNCHIDÆ.

GONORHYNCHUS, Gronov.

- G. greyi*, Richardson, Voy. Erebus and Terror, p. 44, 1846.
 Günther, Cat. VII, p. 373; Macleay Cat. 883.
 Syn.—*G. brevis*, Kner, Voy. Novara, p. 342.
 Figured, Voy. Novara, pl. 16.
 Loc.—*Passim*.
 Vernacular name—*Sand-eel*.

FAMILY CLUPEIDÆ.

ENGRAULIS, Cuv. et Val.

- E. antarcticus*, Castelnau, P.Z.S. Vict. I, p. 186, 1872.
 Macleay Cat. 885.
 Syn.—*E. encrasicholus*, var. *antipodum*, Günther.
 Loc.—*Passim*.
 Vernacular name—*White-bait*.
(E. heterolobus, Rüpp.)
 Günther Cat. VII, p. 392; Macleay Cat. Sup. 1272.
 Loc.—Hobson's Bay, Klünzinger, Archiv. f. Naturg., 1872.

CHATOESSUS, Cuv. et Val.

- C. richardsoni*, Castelnau, P.Z.S. Vict. II, p. 144, 1873.
 Macleay Cat. 888.
 Loc.—Murray R., Castelnau.

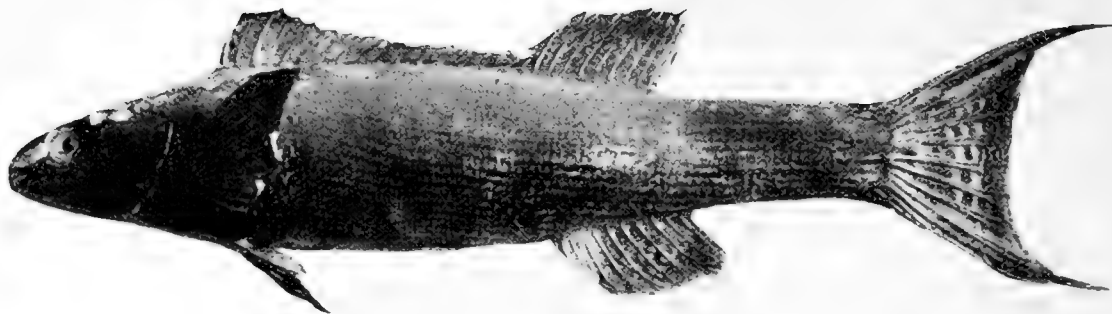
CLUPEA, Cuvier.

- C. sagax*, Jenyns, Zool. Beagle, p. 134, 1842.
 Günther Cat. VII, p. 443; Macleay Cat. 890.
 Syn.—*Alosa melanosticta*, Cuv. et Val., Poissons XX, p. 444.
 Loc.—*Passim*.
 Vernacular name—*Pilchard*.
C. vittata, Castelnau, P.L.S. N.S.W. IV, p. 379, 1879.
 Macleay Cat. 896.
 Vernacular name—*Smelt*, Castelnau, P.Z.S. Vict. I, p. 190.

FAMILY MURENIDÆ.

ANGUILLA, Cuvier.

- A. reinhardtii*, Steind, Sitzb. Ak. Wiss., Wien, 1867.
 Günther Cat. VIII, p. 27; Macleay Cat. 910.
 Loc.—From Western Port, and also, I believe, from the Mordialloc R., Castelnau, P.Z.S. Vict. I, p. 193.
 Vernacular name—Confused with the common *Eel*, Castelnau, l.c.



ANGUILLA, Cuvier—continued.

- A. australis*, Richardson, Voy. Erebus and Terror, p. 112, 1846.
Günther Cat. VIII, p. 36; Macleay Cat. 911.
Figured, Voy. Erebus and Terror, pl. 45.
Loc.—Fresh waters *passim*.
Vernacular name—*Common Eel*.

CONGER, Cuvier.

- C. wilsoni*, Castelnau, P.Z.S. Vict. I, p. 193, 1872.
Macleay Cat. 914.
Loc.—*Passim*.
Vernacular name—*Silver Eel*.

(CONGROMURÆNA, Kaup.)

- (*C. habenata*, Richardson, Voy. Erebus and Terror, p. 109, 1846.)
Günther Cat. VIII, p. 42; Macleay Cat. 916.
Figured, Voy. Erebus and Terror, pl. 50.
Loc.—One specimen seen in Melbourne market, Castelnau, P.Z.S. Vict. I, p. 195.

(MURÆNICHTHYS, Bleeker.)

- (*M. macropterus*, Bleeker, Atlas Ichthy., p. 31.)
Günther Cat. VIII, p. 52; Macleay Cat. Sup. 1278.
Figured, Bleeker Atlas, pl. 7.
Loc.—Port Phillip, Klünzinger, Archiv. f. Naturg., 1872.

FAMILY PEGASIDÆ.

PEGASUS, L.

- P. lancifer*, Kaup, Wieg. Archiv., p. 117, 1868.
Günther Cat. VIII, p. 149; Macleay Cat. 946.
Loc.—Port Phillip, not uncommon.

ORDER V.—LOPHOBRANCHII.

FAMILY SYNGNATHIDÆ.

Group *Syngnathina*.

SYNGNATHUS, Artedi.

- S. semifuscatus*, Günther Cat. VIII, p. 162, 1870.
Günther Cat. VIII, p. 162; Macleay Cat. 947.
Syn.—*S. semistriatus*, Kaup (Macleay).
Loc.—Port Phillip.
Vernacular name—*Pipe-fish*.
(*S. caretta*, Klünzinger, Sitzb. der K. Ak. Wiss. Wien, p. 419, 1879.)
Macleay Cat. Sup. 1281.
Loc.—Port Phillip, Klünzinger, Archiv. f. Naturg., 1872.

UROCAMPUS, Günther.

- U. carinirostris*, Castelnau, P.Z.S. Vict. I, p. 200, 1872.
Macleay Cat. 961.
Loc.—Port Phillip, Castelnau, l.c.

(LEPTOICHTHYS, Kaup.)

- (*L. fistularius*, Kaup, Lophobr., p. 51.)
Günther Cat. VIII, p. 187; Macleay Cat. 962.
Loc.—Port Phillip, Klünzinger, Archiv. f. Naturg., 1872.

STIGMATOPHORA, Kaup.

- S. arcus*, Richardson, T.Z.S. III, p. 183, 1849.
Günther Cat. VIII, p. 189 Macleay Cat. 965.
Figured, T.Z.S. III, pl. 7.
Loc.—Sandridge (specimens in Melbourne Museum).
S. nigra, Kaup, Lophobr., p. 53.
Günther Cat. VIII, p. 190; Macleay Cat. 966.
Loc.—Sandridge (specimens in Melbourne Museum).

Group *Hippocampina*.

(GASTROTOKEUS, Kaup.)

- G. gracilis*, Klünzinger, Archiv. f. Naturg., p. 44, 1872.
Loc.—Port Phillip, Klünzinger, l.c.

(SOLENOGNATHUS, Kaup.)

- S. spinosissimus*, Günther Cat. VIII, p. 195, 1870.
Günther Cat. VIII, p. 195; Macleay Cat. 973.
Loc.—Port Phillip, Klünzinger, l.c.

PHYLLOPTERYX, Kaup.

- P. foliatus*, Shaw, Gen. Zool. V, p. 456, 1803.
Günther Cat. VIII, p. 196; Macleay Cat. 974.
Figured, McCoy, Prodr. Zool. pl. 65.
Loc.—*Passim*.
Vernacular name—*Sea-dragon*.

HIPPOCAMPUS, Leach.

- H. abdominalis*, Kaup, Lophobr., p. 17.
Günther Cat. VIII, p. 199; Macleay Cat. 978.
Loc.—Port Phillip, Klünzinger, J. Bracebridge Wilson dredged it outside the Heads, 1888.
Vernacular name.—*Sea-horse*.
H. breviceps, Peters, Monatsber. Ak. Wiss., Berlin, p. 710, 1869.
Günther Cat. VIII, p. 200; Macleay Cat. 980.
Figured, McCoy, Prodr. Zool. Vict., pl. 65.
Loc.—*Passim*.
Vernacular name—*Short-headed Sea-horse*.
H. noca hollandia, Steind., Sitzungsber. Ak. Wiss. Wien, p. 474, 1866.
Günther Cat. VIII, p. 201; Macleay Cat. 982.
Loc.—Port Phillip, Macleay.
Vernacular name—*Sea-horse*.
(*H. trisus*, Castelnau, P.Z.S. Vict. I, p. 197, 1872.)
Macleay Cat. 983.
Loc.—One specimen from Port Phillip, Castelnau, l.c.



RÖNTGEN RAY PHOTOGRAPH OF SCHNAPPER.

ORDER VI.—PLECTOGNATHI.

FAMILY SCLERODERMI.

MONACANTHUS, Cuvier (Leather Jackets).

M. hippocrepis, Quoy and Gaimard, Voy. Uran. Zool., p. 212, 1824.

Günther Cat. VIII., p. 246; Macleay Cat. 992.

Syn.—*Aleuterius variabilis*, Richardson, Voy. Erebus and Terror, p. 67.

Figured, Voy. Erebus and Terror, pl. 53; McCoy, Prodr. Zool. Vict., pl. 125.

(*M. convexirostris*, Günther Cat. VIII. p. 248, 1870.)

Günther Cat. VIII, p. 248; Macleay Cat. 994.

Loc.—Port Phillip, Hobson's Bay, Klünzinger, Archiv. f. Naturg., 1872.

M. güntheri, Macleay Cat. 998, 18.

Syn.—*M. peronii*, Günther Cat. VIII, p. 249.

Figured, McCoy, Prodr. Zool. Vict., pl. 143.

Loc.—Port Phillip Heads, Warrnambool, McCoy, l.c.

M. browni, Richardson, sp., Voy. Erebus and Terror, 1846.

Figured, McCoy, Prodr. Zool. Vict. pl. 124.

Loc.—Bass Straits, McCoy.

(*M. maculosus*, Richardson, Voy. Erebus and Terror, p. 67, 1846.)

Macleay Cat. 1001.

Figured, Voy. Erebus and Terror, pl. 39; Hollard, Ann. Sci. Nat. Zool. 1854, pl. 14.

Loc.—Port Phillip, Klünzinger, Archiv. f. Naturg., xxxviii.

(*M. forsteri*, Castelnau, P.Z.S. Vict. I. p. 204, 1872.)

Macleay Cat. 1005.

Loc.—One specimen, Castelnau, l.c.

(*M. prasinus*, Castelnau, P.Z.S. Vict. I, p. 205, 1872.)

Macleay Cat. 1006.

Loc.—Only seen once, Castelnau, l.c.

MONACANTHUS, Cuvier (Leather Jackets)—continued.

(*M. baudini*, Castelnau, P.Z.S. Vict. II. p. 55, 1873.)

Macleay Cat. 1007.

Loc.—One specimen from coast of Victoria, Castelnau, l.c.

(*M. lesueurii*, Castelnau, P.Z.S. Vict. II, p. 56, 1873.)

Macleay Cat. 1008.

Loc.—One specimen from Western Port, Castelnau, l.c.

M. sancti-jovanni, Castelnau, P.L.S. N.S.W. II, p. 246, 1877.

Macleay Cat. 1012.

Loc.—Hobson's Bay, Castelnau, l.c.

(*M. granulatus*, White, Voy. N.S.W., p. 295, 1790.)

Günther Cat. VIII. p. 243; Macleay Cat. 1019.

Figured, Voy. Erebus and Terror, pl. 40.

Loc.—Port Phillip, Klünzinger, Archiv. f. Naturg., xxxviii.

M. rudis, Richardson, Voy. Erebus and Terror, p. 65, 1846.

Günther Cat. VIII, p. 244; Macleay Cat. 1020.

Loc.—Bass Straits, Castelnau, P.Z.S. Vict. II, p. 54.

M. trossulus, Richardson, Voy. Erebus and Terror, p. 68, 1846.

Günther Cat. VIII, p. 234; Macleay Cat. 1025.

Loc.—Victoria, Macleay, l.c.

OSTRACION, Artedi.

O. auritus, Shaw, T.Z.S. III, p. 160, 1849.

Günther Cat. VIII, p. 266; Macleay Cat. 1036.

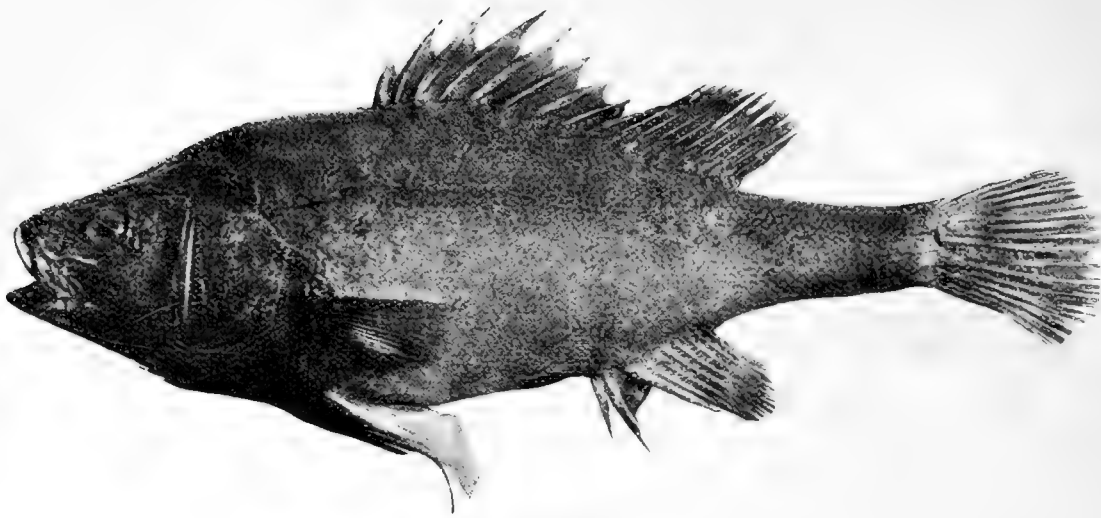
Figured, T.Z.S. III. pl. 9.

Loc.—Port Phillip, Phillip I.

O. amoenus, Castelnau, P.Z.S. Vict. I, p. 207, 1872.

Macleay Cat. 1039.

Loc.—Port Phillip.



GIFFSLAND PERCH.

FAMILY GYMNODONTES.

TETRODON, Bibr.

T. hamiltoni, Richardson, Voy. Erebus and Terror, p. 63, 1846.

Günther Cat. VIII, p. 280; Macleay Cat. 1045.

Figured, Voy. Erebus and Terror, pl. 39.

Loc.—Port Phillip.

Vernacular name—*Toad-fish*.

(*T. richi*, Fréminv, Nouv. Bull. Philom. II, p. 250.)

Günther Cat. VIII, p. 285; Macleay Cat. 1046.

Figured, Bleeker, Atlas, pl. 9.

Loc.—Port Phillip, Klünzinger, Archiv. f. Naturg., xxxviii.

T. hispidus, L. Syst. Nat. I, p. 411.

Günther Cat. VIII, p. 297; Macleay Cat. 1053.

DIODON, Linnaeus.

D. spinosissimus, Cuv. Mém. Mus., p. 134, 1818.

Günther Cat. VIII, p. 307; Macleay Cat. 1060.

Loc.—Port Phillip, Castelnau, P.Z.S. Vict. I, p. 2.

D. blochii, Castelnau, P.Z.S. Vict. I, p. 210, 1872.

Macleay Cat. 1062.

Loc.—Port Phillip, Castelnau, l.c.

Vernacular name—*Porcupine-fish*.

(CHILOMYCTERUS, Bibr.)

(*C. jaculiferus*, Cuv. Mém. Mus., p. 130, 1818.)

Günther Cat. VIII, p. 313; Macleay Cat. 1063.

Loc.—One specimen from Hobson's Bay, Castelnau, P.Z.S. Vict. I, p. 211.

ORTHAGORISCUS, Bloch., Syst. Ichthy. Ol. (Schneider), p. 510, 1801.

O. mola, L.

Günther Cat. VIII, p. 317; Macleay Cat. 1063.

Vernacular name—*Sun-fish*.

SUB-CLASS II.—PALÆICHTHYES.

ORDER I.—GANOIDIÆ.

None recorded.

ORDER II.—CHONDROPTERYGII.

FAMILY CHIMERIDÆ.

CALLORHYNCUS, Gronovius.

C. antarcticus, Lacépède Hist. Poissons I, p. 400, 1798.

Günther Cat. VIII, p. 351; Macleay Cat. 1070.

Syn.—*C. peronii*, Dum.

C. capensis, Dum.

C. australis, Shaw and Owen.

C. tasmanius, Richardson.

Loc.—Port Phillip Heads and S. coast.

Vernacular name—*Elephant Shark*.

FAMILY CARCHARIIDÆ.

(CARCHARIAS, Cuvier.)

(*C. melanopterus*, Muller and Henle, p. 43, 1841.)

Günther Cat. VIII, p. 369; Macleay Cat. 1077.

Loc.—One specimen from Hobson's Bay, McCoy.

GALEUS, Cuvier.

G. australis, Macleay Cat. 1079, 1880.

Figured, McCoy, Prodr. Zool. Vict., pl. 64.

Loc.—*Passim*.

Vernacular name—*Tope*.

ZYGÆNA, Cuvier.

Z. malleus, Shaw, Nat. Misc.

Günther Cat. VIII, p. 381; Macleay Cat. 1080.

Figured, McCoy, Prodr. Zool. Vict., pl. 56.

Loc.—Port Phillip.

Vernacular name—*Hammer-headed Shark*.

MUSTELUS, Cuvier.

M. antarcticus, Günther Cat. VIII, p. 387, 1870.

Macleay Cat. 1081.

Figured, McCoy, Prodr. Zool. Vict., pl. 87.

Loc.—*Passim*.

Vernacular name—*Smooth-hound Gummy*.

FAMILY LAMNIDÆ.

CARCHARODON, Muller and Henle.

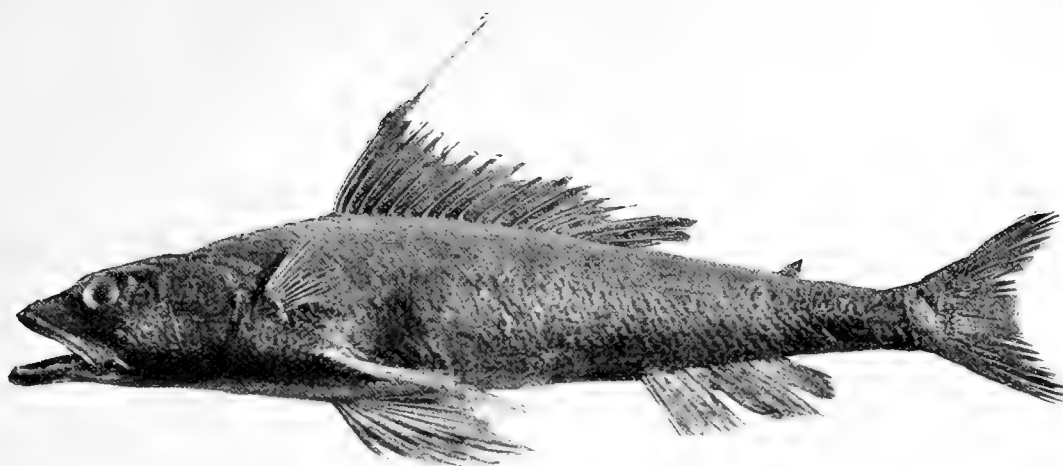
C. rondeletii, Muller and Henle, p. 70, 1841.

Günther Cat. VIII, p. 392; Macleay Cat. 1083.

Figured, McCoy, Prodr. Zool. Vict., pl. 74.

Loc.—Hobson's Bay, McCoy, l.c.

Vernacular name—*White Shark*.



THE AUSTRALIAN AULOPUS.

ODONTASPIS, Agassiz.

- O. americanus*, Mitch. sp., Phil. and Lit. Trans. New York I, p. 483.
 Günther Cat. VIII, p. 392; Macleay Cat. 1084.
 Syn.—*O. taurus*, Muller and Henle, p. 73.
 Figured, McCoy, Prodr. Zool. Vict., pl. 64.
 Loc.—Hobson's Bay, McCoy, l.c.

ALOPECIAS, Muller and Henle.

- A. vulpes*, L. Syst. Nat. Cuv. Gmelin I, p. 1496, 1788.
 Günther Cat. VIII, p. 393; Macleay Cat. 1085.
 Figured, McCoy, Prodr. Zool. Vict., pl. 88.
 Loc.—Hastings, McCoy, l.c.; Queenscliff, J. Bracebridge Wilson.
 Vernacular name—*Thresher Shark*.

FAMILY NOTIDANIDÆ.

NOTIDANUS, Cuvier.

- N. indicus*, Cuvier, Règne Animal, 1830.
 Günther Cat. VIII, p. 398; Macleay Cat. 1086.
 Figured, McCoy, Prodr. Zool. Vict., pl. 43.
 Loc.—Hobson's Bay, McCoy, l.c.

FAMILY SCYLLIDÆ.

PARASCYLLIUM, Gill.

- P. nuchale*, McCoy, A.M.N.H. XIII, p. 15, 1874.
 Macleay Cat. 1090.
 Figured, McCoy, l.c., pl. 2.
 Loc.—Port Phillip, McCoy, l.c.

CROSSORHINUS, Muller and Henle.

- C. barbatus*, L. Cyst. Nat. Cuv. Gmelin, p. 1493, 1788.
 Günther Cat. VIII, p. 414; Macleay Cat. 1095.
 Figured, McCoy, Prodr. Zool. Vict., pl. 43.
 Loc.—Hobson's Bay, McCoy, l.c.
 Vernacular name—*Carpet Shark*, *Wobbegong*.

FAMILY CESTRACIONTIDÆ.

HETERODONTUS, De Blainville.

- H. phillipii*, Lacépède, Hist. des Poissons I, p. 218, 1798.
 Macleay Cat. 1097.
 Figured, McCoy, Prodr. Zool. Vict., pl. 113.
 Loc.—*Passim*.
 Vernacular name—*Port Jackson Shark*, *Pig-fish*.

FAMILY SPINACIDÆ.

ACANTHIAS, Muller and Henle.

- A. vulgaris*, L. Syst. Nat., p. 397.
 Günther Cat. VIII, p. 418; Macleay Cat. 1099.
 Figured, McCoy, Prodr. Zool. Vict., pl. 75.
 Loc.—Hobson's Bay, McCoy, l.c.
 Vernacular name—*Picked Dog-fish*.

(ECHINORHINUS, De Blainville.)

- E. spinosus*, L. Syst. Nat. Cuv. Gmelin I, p. 1500, 1788.)
 Günther Cat. VIII, p. 428.
 Figured, McCoy, Prodr. Zool. Vict., pl. 144.
 Loc.—One specimen from Portland, McCoy, l.c.

FAMILY RHINIDÆ.

RHINA, Klein.

- R. squatina*, L. Syst. Nat. I, p. 398.
 Günther Cat. VIII, p. 430; Macleay Cat. 1103.
 Figured, McCoy, Prodr. Zool. Vict., pl. 34.
 Loc.—Not very uncommon in Hobson's Bay and around our coasts, McCoy, l.c.
 Vernacular name—*Angel-fish*.

FAMILY PRISTIOPHORIDÆ.

PRISTIOPHORUS, Muller and Henle.

- P. nudipinnis*, Günther Cat. VIII, p. 432, 1870.
 Günther Cat. VIII, p. 432; Macleay Cat. 1105.
 Figured, McCoy, Prodr. Zool. Vict., pl. 56.
 Loc.—*Passim*.
 Vernacular name—*Saw-fish*.

FAMILY SELACHIDÆ.

(CETORHINUS, De Blainville.)

- (*C. maximus*, Günner, Trondj. Selsk. Skrift, III, p. 33, 1765.)
 Günther Cat. VIII, p. 394; Macleay Cat. Sup. 1285.
 Figured, McCoy, Prodr. Zool. Vict., pl. 104.
 Loc.—One specimen, Portland, McCoy, l.c.
 Vernacular name—*Basking Shark*.

FAMILY RHINOBATIDÆ.

TRYGONORHINA, Muller and Henle.

- T. fasciata*, Muller and Henle, p. 124.
 Günther Cat. VIII, p. 448; Macleay Cat. 1111.
 Figured, Muller and Henle, pl. 43.
 Loc.—"Common in S. part of Port Phillip," J. Bracebridge Wilson.
 Vernacular name—*Fiddler Ray*.

FAMILY TORPEDINIDÆ.

NARCINE, Henle.

- N. tasmaniensis*, Richardson, T.Z.S. III, p. 178, 1849.
 Günther Cat. VIII, p. 452; Macleay Cat. 1112.
 Figured, T.Z.S. III, pl. 11.
 Loc.—One specimen St. Kilda Beach; also in Bass
 Straits, Castelnau, P.Z.S. Vict. I, p. 223.

FAMILY RAJIDÆ.

RAJA, Cuvier.

- R. lemprieri*, Richardson, Voy. Erebus and Terror,
 p. 43, 1846.
 Günther Cat. VIII, p. 463; Macleay Cat. 1114.
 Figured, Voy. Erebus and Terror, pl. 23.
 Loc.—*Passim*.
 Vernacular name—*Thornback Ray*
 (*R. dentata*, Klünzinger, Archiv. f. Naturg., xxxviii,
 p. 46, 1872.)
 Macleay Cat. Sup. 1289.
 Loc.—“Port Phillip,” Klünzinger, l.c.
R. scabra, Douglas Ogilby, Cat. Fishes in Australian
 Museum, Part I, 1888.
 Macleay Cat. 1115.
 Syn.—*R. rostrata*, Castelnau, P.Z.S. Vict. II, p. 57.
 Loc.—Port Phillip, Castelnau.

FAMILY TRYGONIDÆ.

UROLOPHUS, Muller and Henle.

- U. testaceus*, Muller and Henle, p. 174, 1841.
 Günther Cat. VIII, p. 486; Macleay Cat. 1121.
 Figured, Muller and Henle, pl. 56.
 Loc.—Port Phillip (Morton, Lucas).

FAMILY MYLIOBATIDÆ.

MYLIOBATIS, Cuvier.

- M. nieuhofii*, Cuv. Règne Animal, 1830.
 Günther Cat. VIII, p. 491; Macleay Cat. 1123.
 Loc.—*Passim*.
 Vernacular name—*Eagle Ray*, *Sting Ray*.
 (*M. australis*, Macleay Cat. 1124, 1880.)
 Figured, McCoy, Prodr. Zool. Vict., pl. 63.
 Loc.—One specimen Queenscliff, McCoy, l.c.

SUB-CLASS III.—CYCLOSTOMATA.

FAMILY PETROMYZONTIDÆ.

MORDACIA, Gray.

- M. mordax*, Richardson, Voy. Erebus and Terror, 1846.
 Günther Cat. VIII, p. 507; Macleay Cat. 1127.
 Figured, Voy. Erebus and Terror, pl. 38.
 Loc.—Lower Yarra, Castelnau, P.Z.S. Vict. I,
 p. 229.
 Vernacular name—*Lamprey*.

(NEOMORDACIA, Castelnau.)

- (*N. howittii*, Castelnau, P.Z.S. Vict. I, p. 232, 1872.)
 Macleay Cat. 1128.
 Loc.—One specimen, Cape Schanck, Castelnau, l.c.

GEOTRIA, Gray.

- G. australis*, Gray, P.Z.S., p. 238, 1851.
 Günther Cat. VIII, p. 508; Macleay Cat. 1129.
 Loc.—Saltwater R., Castelnau, P.Z.S. Vict. I, p.
 227.

(YARRA, Castelnau.)

- (*Y. singularis*, Castelnau, P.Z.S. Vict. I, p. 231, 1872.)
 Macleay Cat. 1132.
 Loc.—One specimen, Lower Yarra, Castelnau, l.c.

SUB-CLASS IV.—LEPTOCARDII.

FAMILY CIRROSTOMI.

BRANCHIOSTOMA, Costa.

- B. lanceolatum*, Pallas, Spicil. Zool. X, p. 19, 1769.
 Günther Cat. VIII, p. 513; Macleay Cat. 1133.
 Figured, E. Ray Lankester, Q.J.M.S., 1889.
 Loc.—Port Phillip and Western Port (if our species
 be identical with above).
 Vernacular name—*Lancelet*.

The following is a popular description of the fishes as they occur in the tanks. To give a full, true, and particular account of each specimen would require a large volume, so that it has been deemed expedient to merely give a photographic reproduction of those fishes most commonly found in the tanks with a few words as to the best known characteristics of each.

THE SCHNAPPER.

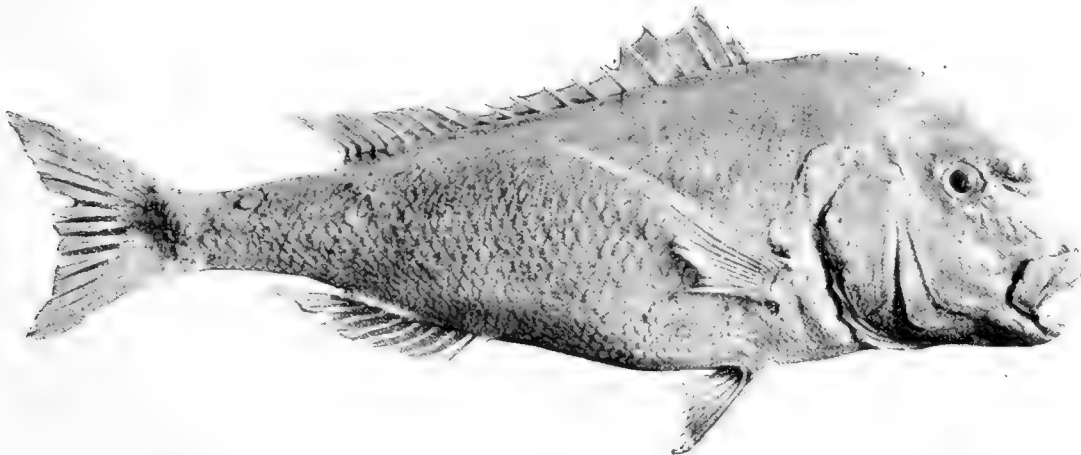
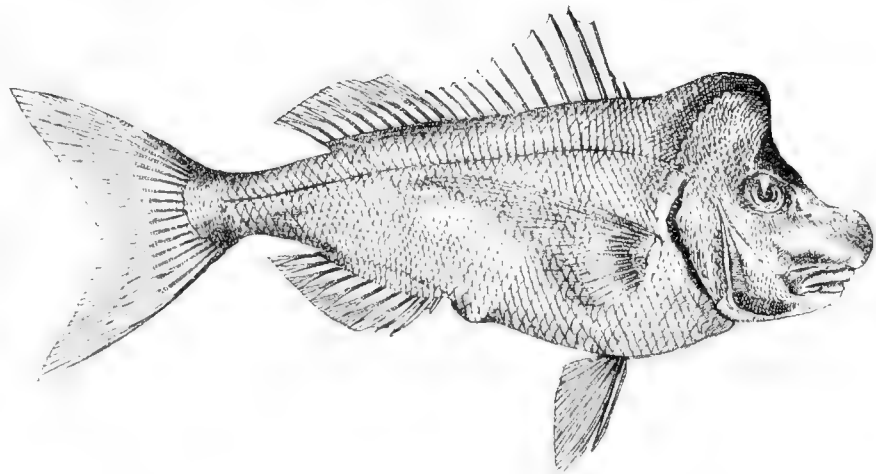
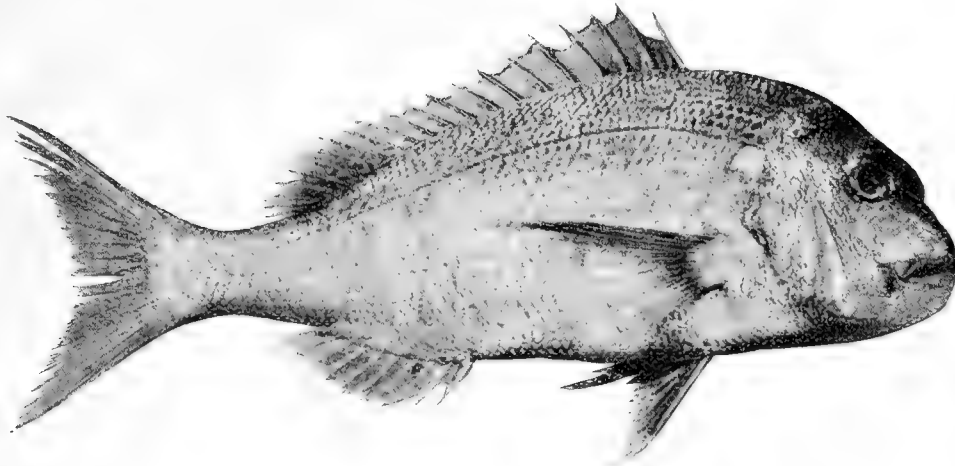
(*Pagrus unicolor*.)

This is one of the finest fish that come to the Melbourne market, and is a universal favorite, both with the angler and the gourmand. At one time they could be caught in any part of Hobson's Bay, but now are exceedingly scarce. The principal fishing grounds for this fine fish are off Rickett's Point, beyond Brighton; and if one can only get on to the reef around which a "school" of Schnapper has started to feed a very lively quarter of an hour can be obtained. The "old man" Schnapper runs up to about 30 lbs. weight, and with age develops a peculiar lump on the nose, which is entirely missing in the younger specimens. In colour it is a beautiful pink, with iridescent spots. They are gross feeders in the tanks, and when once acclimatised give no trouble. The specimens in the tanks have been obtained with great trouble, and are denizens of the Aquarium for over three years.

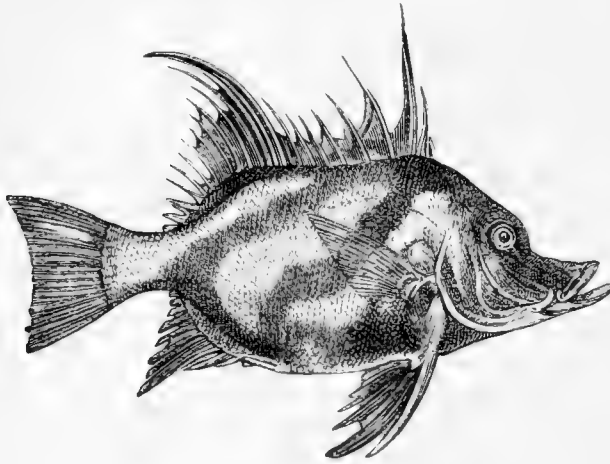
The Schnapper is found in almost all Australian waters, from New Zealand to Norfolk Island, and haunts the reefs contiguous to the coast. The favorite bait is salted pilchard or squid. The native name of this fish is "Wollomai."

The bait for these fishes is squid, starfish, and the hind slice of almost any other fish, and, as before remarked, there is hardly any other fish in Australian waters that will give better sport to the amateur, or a better financial result to the fisherman.

A few years ago, when the Harbor Trust was pouring immense volumes of silt into the Bay, this fine fish became almost extinct inside the Heads, but as this course has been abandoned for the last two or three years, I am glad to see that the Bay is again being fully restocked with this our king of fishes. The smaller specimens which will be seen in the grotto tanks, were all caught off the back



beach at Williamstown, and as the young brood are allowed to grow and propagate their species, anglers may in a short time look forward to good takes of this favorite fish, and “schnapper *au gratin*” for the matutinal meal.



THE BOAR FISH.

(*Histiogaster recurvirostris*.)

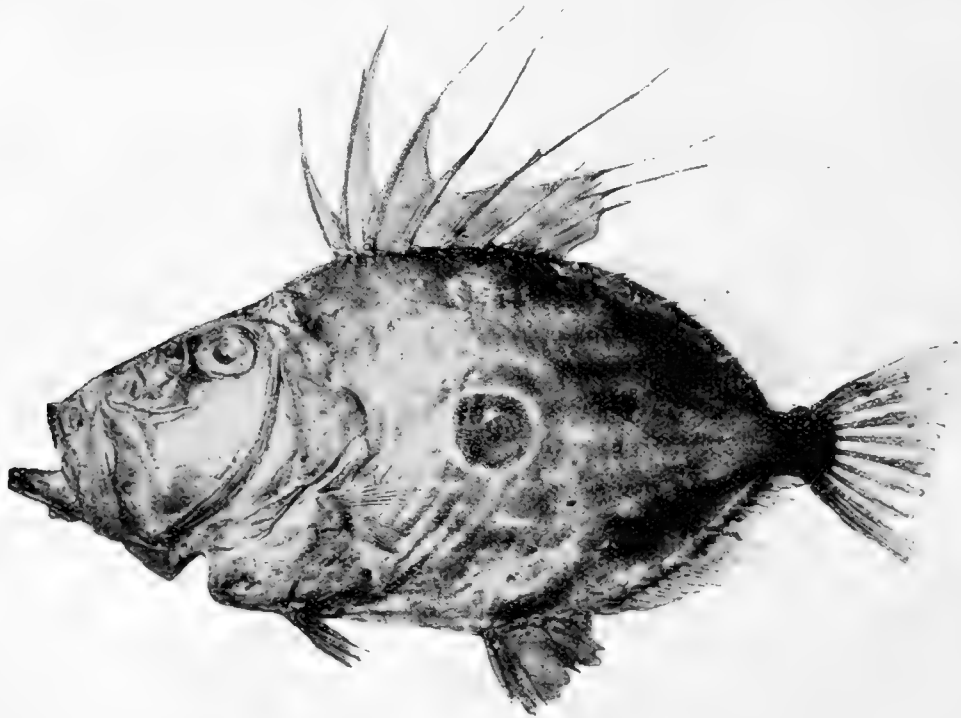
The shape of this fish is most peculiar, the head being extended in a long muzzle, the nostrils being situated at the base.

The upper parts are of a greyish hue, and the lower ones of a dirty white, broad bands of a dark hue crossing the sides from dorsal to caudal fins. Those specimens which have been exhibited in the tanks have excited a great deal of curiosity through their remarkable shape and structure, and it is to be regretted that their rarity prevents their more frequent exhibition.

JOHN DOREY.

(*Zeus Faber*.)

This fish is rather uncommon and not often found in the tanks; it is supposed to be that fish which was caught by St. Peter in the sea of Galilee, and out of whose mouth he took the tribute

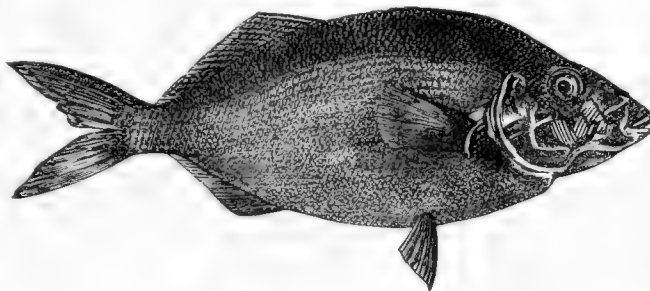


for the Saviour and himself. This tradition supposes that the marks each side of the fish are those of St. Peter's finger and thumb.

THE BASTARD TRUMPETER.

(Lastris Fosteri.)

This beautiful fish claims our attention not only on account of its graceful appearance, but by the beautiful colours which it possesses, and, which, unfortunately, do not long last when the specimens have been inmates of the Aquarium for any length of time. This is doubtless due to the want of the natural conditions in which they ordinarily live. The higher part of the body is generally of a dark greeny-brown, tending to a purple, transverse lines of bright colours running from head to tail, and the belly and tail yellow, while a rainbow iridescence of colours is seen from time to time when the specimens come under the direct rays of light. It is an excellent table fish.



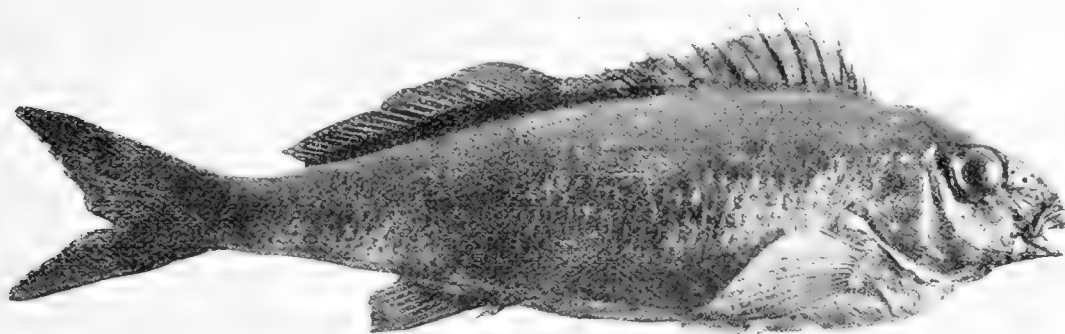
THE TASMANIAN TRUMPETER

Is marked with dark and light green longitudinal stripes. The specimens shown are brought over from Hobart in a well-boat, and do extremely well in the tanks.

THE BUTTER FISH.

(Chilodactylus nigricans.)

This fish varies a good deal in colour, the general tinge being of a slaty blue, mottled with white. The pectoral fins are elongated, and terminate in single rays, which are used to enable the fish to cling to the rock or sea-weeds on which it rests whilst awaiting its food.

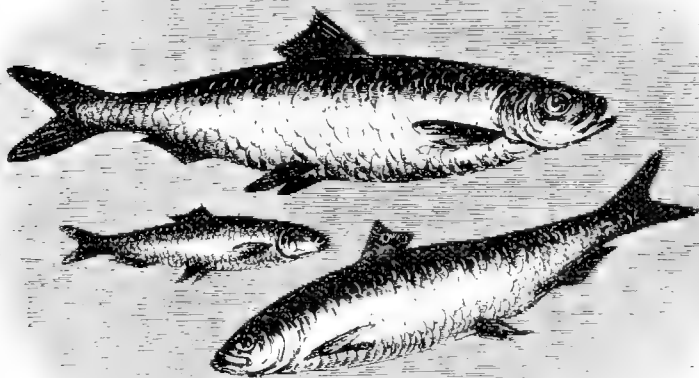


They become extremely tame, and after a very short time will feed from the keeper's hand : in fact, they are the "pets" of our sea-coast, if such a term may be applied to them. Any visitors wishing to verify this fact have only to speak to the keeper, at feeding time, and he will show them the Butter Fish taking their food from his fingers.

THE PILCHARD.

(Clupea sagax.)

The Pilchard, which belongs to the Herring tribe, is represented by the bottom figure, the smallest being the Sprat, and the largest the Herring, which are not found in these waters, strange to say, although so closely allied to the Pilchard. These fish are but seldom seen alive in the tanks, owing to the extreme delicacy of their texture, the scales coming off, and so causing injury on the least handling. It is a pity that some practical use cannot be made of this splendid article of food supply which sometimes visits our coasts in such enormous quantities that the water is literally alive with them.



Mr. Lindsay G. Thompson, the Chief Inspector of Fisheries of New South Wales, writes as follows :—

“A species of herring (*Clupea sagax*) almost identical with the English pilchard makes its appearance on the coast of New South Wales annually in June or July. It is called by the fishermen *Maray*, probably a native name, though this term is sometimes applied to other species of herring. The shoals are described as enormous, covering miles of sea, and accompanied by flights of birds and numbers of large fishes. These shoals are generally observed from 1 to 3 miles from the land, and are always proceeding in a northerly direction. The same fish is reported by Dr. Hector, F.R.S., Director of the Colonial Museum, Wellington, New Zealand, to visit the east coast of Otago every year in February or March. In 1877 ‘a shoal was observed there migrating southwards. It extended as far as

the eye could reach, followed by multitudes of gulls, mutton-birds, barracoota, and porpoises. So densely packed were they that by dipping a pitcher into the sea it would be drawn out half full of fish, so that by the use of large boats and suitable nets thousands of tons could have been caught.’ There is much that is curious about the migrations of this fish; all the shoals which pass here in winter are going north, while the shoals visiting Otago in summer are going south. It is a matter for inquiry—‘Are they the same fishes returning to their homes in the Antarctic seas after months of travel in search of spawning grounds? If so, how far north do they go? And where are their breeding grounds?’”

There is no doubt that there is an enormous source of revenue yearly lost to all the coastal inhabitants through the non-utilization of this magnificent *ocean harvest*, and it would be a good suggestion that all those who have opportunities, such as fishermen, masters of coasting vessels, &c., should make notes of *where* and *when* they came across shoals of fish; the kinds of fish, of which a specimen or two should be placed in spirits for identification; the *direction* in which the shoals were moving; the apparent extent of them; whether the fish were full or spent; and of any other items occurring to the observer at the time. The Sardine industry of the Mediterranean is worth millions per annum, and employs thousands of men, women, and children in its various branches, and we are neglecting a great source of wealth in not taking advantage of this bountiful supply of nature.

THE BLENNY.

(Cristicips sp.)

A number of varieties of this little fish will be seen in the various tanks. It has the depending barbels, which are used for seeking out its food. It is commonly found amongst the small rocky pools and on the grass beds, and does not attain any large size.

THE SALMON TROUT.

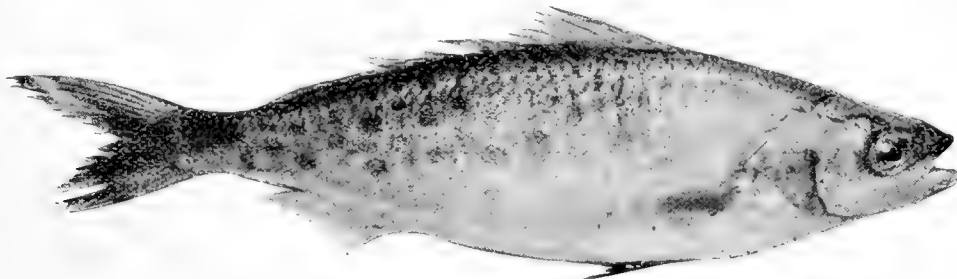
(Arripis truttaceus.)

This well-known fish is, when young, called "Trout" or "Salmon Trout," by the fishermen, and when full-grown and about 2 feet long is designated "Salmon." In the cold weather it disappears almost entirely from the coast, but re-appears again in the summer, when sometimes immense shoals are met with. The flesh is rather dry and insipid, except when cooked immediately after capture, but owing to its being caught in large quantities it is an important factor in the supply of fish food. It has an unfortunate predilection for "going bad" on the shortest notice, and nearly all cases of fish-poisoning have been traced to this fish and its congeners. The young are prettily marked with dark bands and yellow spots, but the adults, as a rule, take a dull silvery colour. It is caught both with hook and line and with nets.

THE ROUGHY

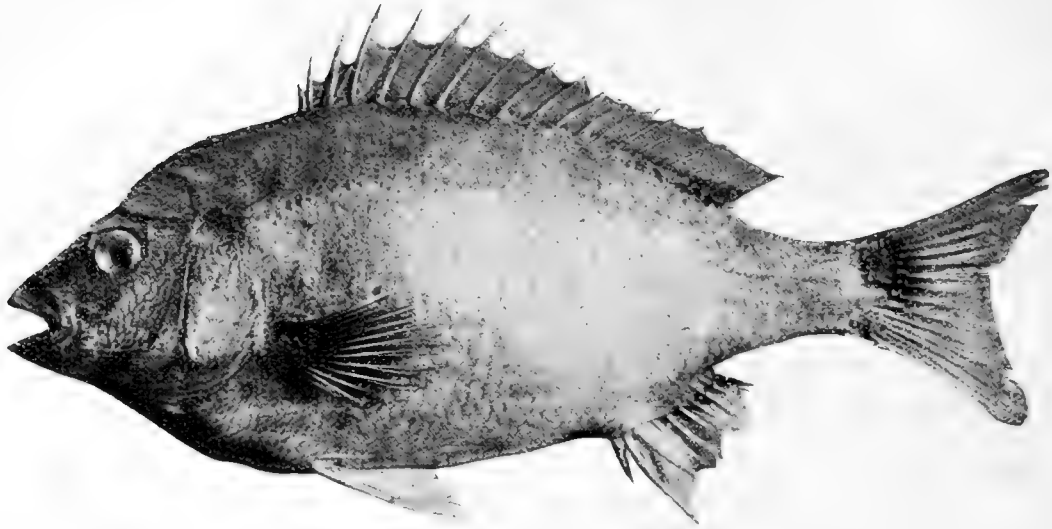
(Arripis Georgianus)

When young is very similar to the Salmon Trout fry. It can, however, be always distinguished by the touch—the skin being rough, owing to the scales being strongly ciliated. It generally travels in shoals, and is occasionally taken in great quantities. It is highly esteemed as



a table fish when fresh caught, but, like the Salmon Trout, very soon goes wrong. It is very difficult to keep specimens of this fish any length of time in the tanks, as it seems to be subject to a peculiar disease of the head, which causes it to dart about and hurt itself against the sides of the tank.

THE BREAM.

(Chrysophrys Australis.)

A well-known fish, and highly esteemed for the table. It is a sea-fish, but sometimes enters the rivers, where it affords good sport to the knights of the rod. It resembles the Schnapper in shape, and in colour is a leaden grey, darker on the upper parts. The weight rarely exceeds 5 or 6 lbs., but is usually much less.

THE SILVER BREAM

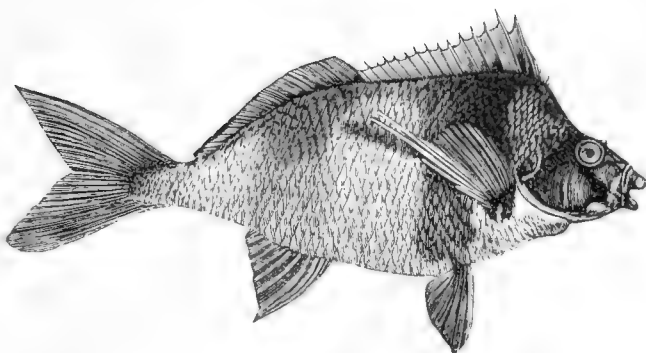
(Caranx Georgianus)

Is to be seen in quantities at the market, as sometimes large takes are made in the Bay with the nets. When alive and just caught it has the most beautiful iridescent colours, which vanish a short time after death.

THE MAGPIE PERCH

(*Chilodactylus gibbosus*)

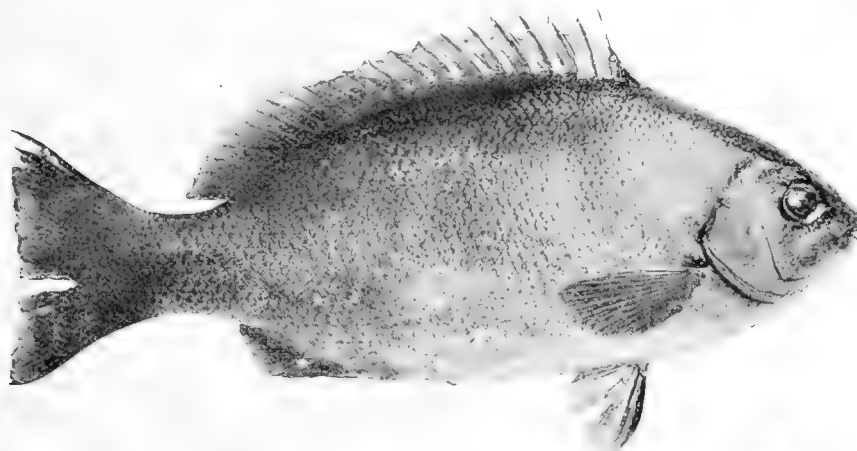
Will be readily recognised from its peculiar appearance. In colour it is a pinky white, with two large transverse bands of brown or black colour. Its natural habitat is amongst the weeds, as can be seen from the peculiar formation of the pectoral fins, which are elongated in the rays to permit of their being used for supports, as in the case of the Butter Fish. It is more plentiful in the warm months of the year, but at no time is it taken in large quantities. The specimens shown are from the back beach at Queenscliff.



THE LUDRICK.

(*Melanichthys tricuspidata*.)

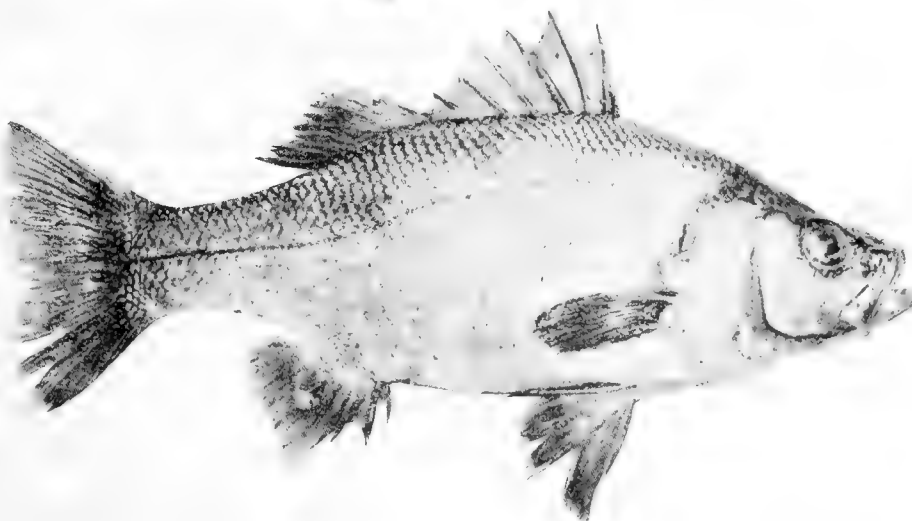
One of the best table fishes though not at all common, it is found in the Gippsland Lakes, and is also caught in Hobson's Bay. On being cooked it has a very thick skin, which peculiarity together with its triple row of teeth distinguish it from the ordinary Black Perch, which it much resembles.



GIPPSLAND PERCH.

(*Latris colonorum*.)

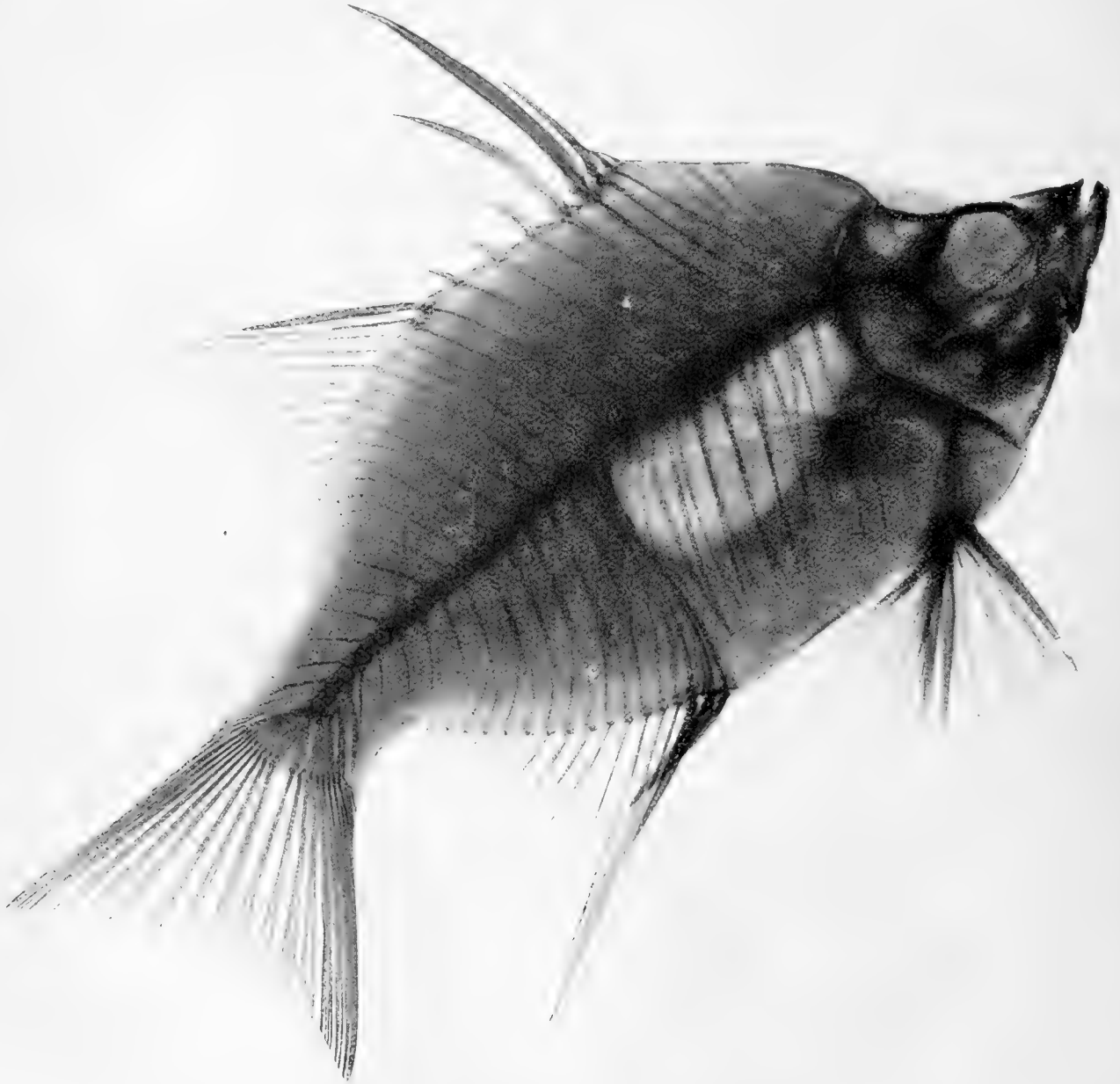
This fish abounds in the Gippsland Lakes whence large quantities are forwarded to the Melbourne market, as it is an excellent table fish. It is also caught in the Bay where it especially affects the creek and river mouths.



THE OLD WIFE.

(Enoplosus armatus.)

This lovely little fish is one of the most popular of the varied denizens of the Aquarium. It is beautifully marked with dark bands, on a ground of silvery grey, and pursues a majestic course, the motion of its fins being hardly seen. It is mostly caught about the sandy reaches at Queens-cliff, and is very sensitive to cold, disappearing always on the approach of winter.

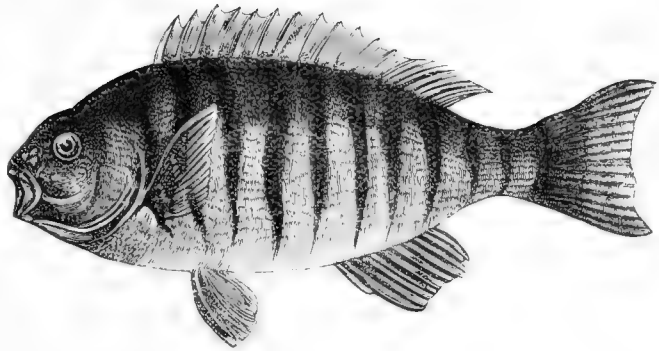


OLD WIFE, TAKEN BY RONTGEN RAY PROCESS BY DR. CLENDINNEN.

THE ZEBRA FISH

(*Neotephræops zebra*)

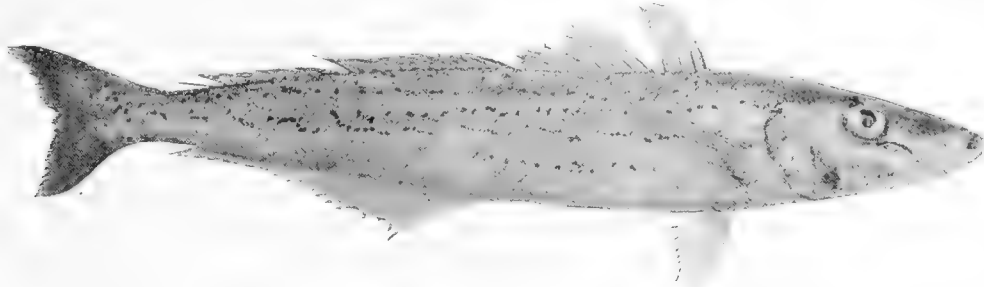
Is a nice lively little fellow, of a dark-grey colour, with eight or nine transverse black bands from back to belly. The specimens shown in the tanks are obtained from the vicinity of Rickett's Point, between Mordialloc and Brighton, but the fish is not by any means rare. It is peculiar in that the head is covered with tiny scales. It is very little bother in the tanks—feeding well, and being easily acclimatised.



THE WHITING

(*Silago punctata*)

Is one of the best-known fish in the Melbourne market, and one of the most toothsome. Fried Whiting is as well known a feature of our "menu" as ox-tail soup. It sometimes attains



a large size, and scales 3 or 3½ lbs. It frequents mostly nice sandy patches, and gives excellent sport with the line should the angler happen to drop on a school just at the turn of the tide. It is a nice silvery colour, dark on top and speckled, something like a trout, with brown spots.

THE STRANGER

(*Odax Richardsoni*)

Is sometimes called the "Rock Whiting," and resembles the ordinary Whiting something in shape but has longer jaws, and is clad in a variety of beautiful tints. It has a peculiar method

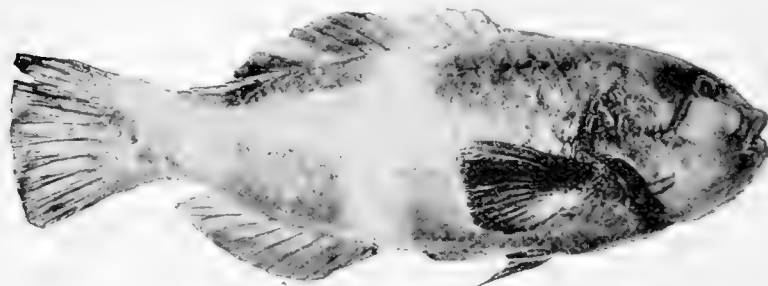


of swimming, caused by a lateral motion of the dorsal fin. There are several varieties, which differ considerably in colour. It is not esteemed as an edible fish, the flesh being soft, and having a peculiar coppery taste.

THE PARROT FISH

(Labrichthys)

Obtains its generic name from its many and bright colourations so similar to its feathered compeers. It would be almost impossible to describe the many varieties and differences of this family. It possesses all the colours — sometimes mottled, sometimes in bands, and occasionally almost all one colour. Its natural habit is to “roost” or rest on the rocks or bottom of the tanks, and make sudden excursions in search of food. It is provided with sharp prominent teeth, and is very fierce, fighting like the Kilkenny cats



until generally only one specimen is left in any tank in which they are placed. Visitors will note that nearly all specimens carry scars, silent witnesses to their combative valour.

THE FLATHEAD

(Platycephalus lævigatus)

Is almost too well known to need description, as it is the commonest fish in Hobson's Bay. There are several varieties. The Sand Flathead (which is here figured) is the commonest, and can be caught nearly all over the Bay.



The Grass Flathead frequents the grass beds along the coast line, while the Rock Flathead may be found amongst the sea-weed growing in the rocky reefs, whenever such occur. The latter variety attains a large size, scaling up to 8 or 9 lbs., and is, if anything, of a better flavour than the other varieties. The colour varies, as they have the same property as the Flounder of assimilating their tint to that upon which they rest.

THE ROCK LING

(Gempyterus Australis)

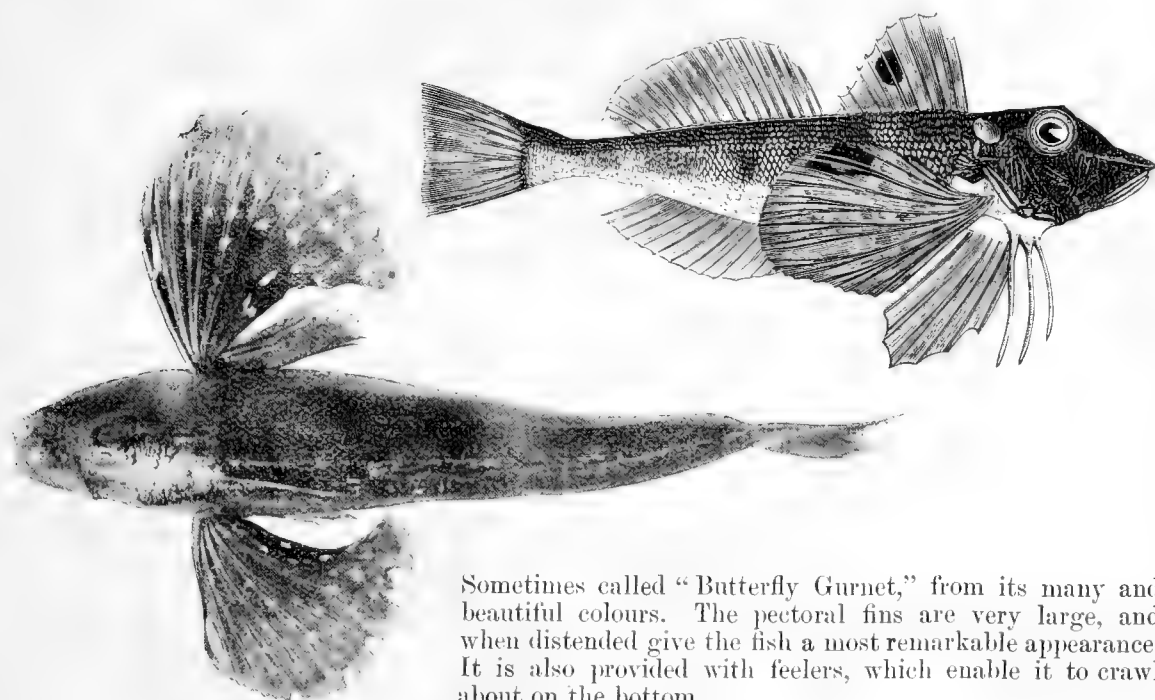
Must not be confounded with the “salted ling” of commerce, which is a different thing altogether. This fish is provided with barbels, is of a light-pink colour, marbled with



dark-purple or black blotches, and is white on the belly. It is found amongst the rocks, and hides itself in the holes and crevices. It is nocturnal in its habits, and all the holes of the rockwork in the tanks in which it is shown have to be carefully filled up, or the specimens would retire from the public gaze. A peculiar parasite, which sometimes attains the size of the top of one's thumb, is often found in its gills.

THE FLYING GURNET

(*Trigla polyommata*),



Sometimes called "Butterfly Gurnet," from its many and beautiful colours. The pectoral fins are very large, and when distended give the fish a most remarkable appearance. It is also provided with feelers, which enable it to crawl about on the bottom.

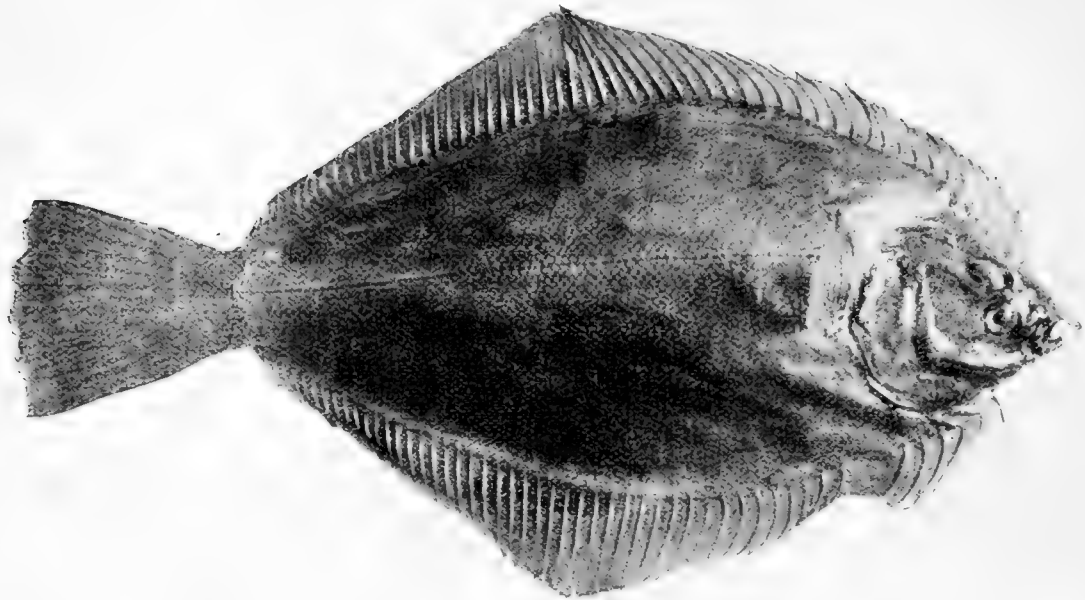
THE GURNET.

(*Centropogon
Australis*.)

This well-known fish has little to say in its favour. It is nearly all head, fins, and bones, and is an awkward customer to get hold of, as the dorsal spines are sharp, and inflict a nasty sting.

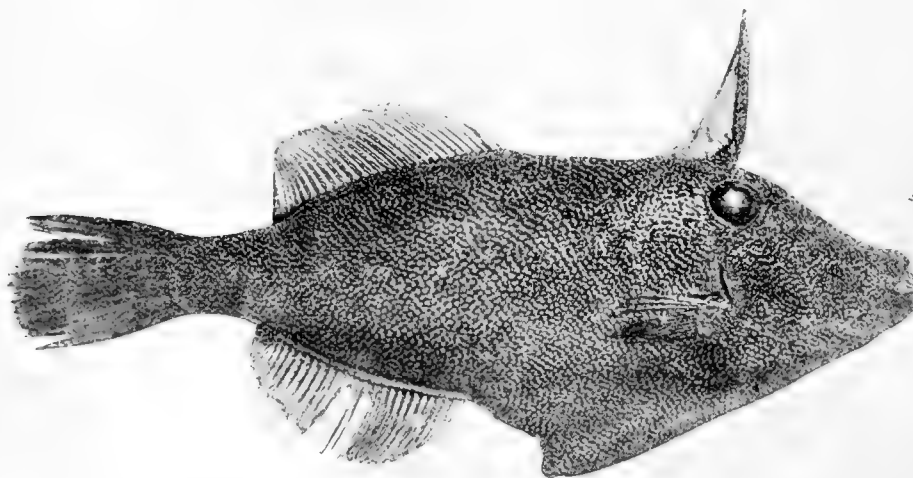


THE FLOUNDER

(Pleuronectes Victorie)

Is the commonest of the flat fishes. It is greatly esteemed for the exquisite flavour of its flesh; lives mostly along the sandy reaches of the sea-shore, and is always caught in nets, although it will sometimes take the bait. It is a curious fact that the very young of this fish swim in the same way as other fish, and it is only on taking to living on the sand that they adopt the appearance under which they are generally known—the uppermost side being coloured, the lower not, and, stranger still, the eye works round from the lower or “blind” side. This fish swims with a graceful undulating motion, and has the capability of taking the colour of the ground upon which it settles, nature having thus provided it with a means of escaping the attention of its enemies.

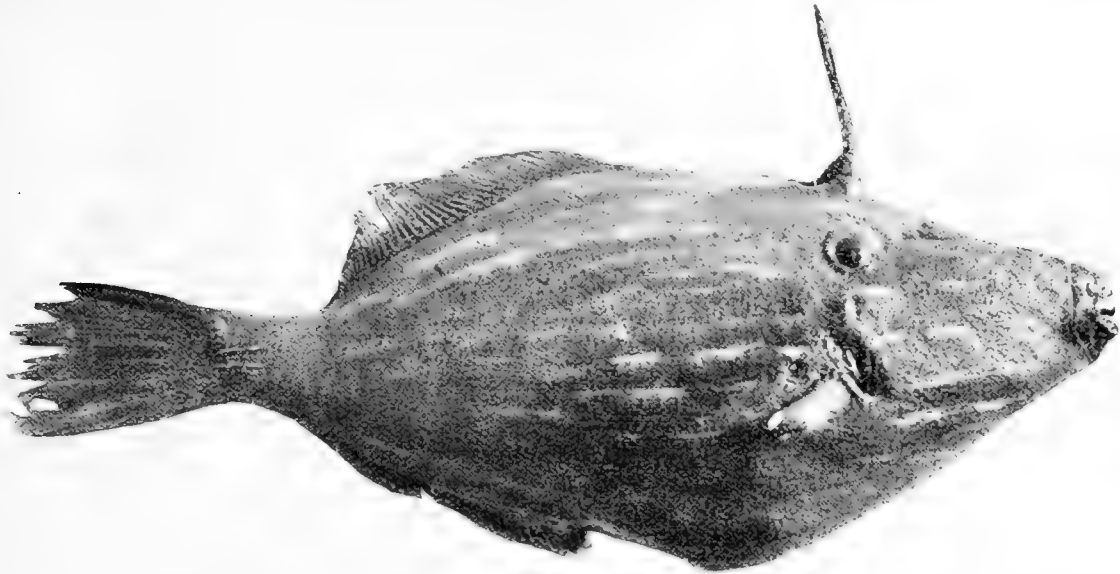
THE LEATHER-JACKET.

(Monocanthus.)

Monocanthus signifies “one-horned,” and for aught we know here is the origin of our unicorn which appears in the Royal coat of arms; at any rate, the rhinoceros has not got it all his own way. This fish has no scales, but a rough skin. It is not bad

eating if cooked after being skinned. There are numerous distinct varieties, having different colours and shapes, but all being easily recognisable as members of the same family. It exists in immense quantities in the Bay, and is the angler's curse, as no sooner is the hook in the water than it swarms round and commences to nibble the bait. It is easily caught in a hoop net, for which the favorite bait is a piece of raw potato. When dying it has the chameleon characteristic of changing its colours.

The above specimen is one of the varieties known as the "tooth-brush," from the peculiar ridge of bristles which grow on each side of the body near the tail.



This is another variety of this species, and differs considerably from the "tooth-brush" variety described before. This variety is generally a very dark-blue, with other beautiful iridescent spots, streaks, or lines, whilst the fins are of a beautiful pale yellow. Some of this variety attain a large size, being caught up to 2 feet long. Instead of the "tooth-brush," on each side of the body near the tail may be seen a row of horny excrescences. These seem to be merely a freak of nature, and are not used for offensive or defensive purposes.

THE COBBLER.

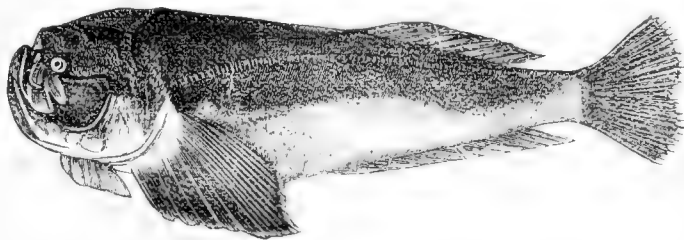
(*Pentaroge marmorata*.)

This little fish is sometimes called the "Scorpion" by the fishermen, and is much dreaded by them when engaged in dragging the nets on the grass beds which he frequents. Each gill terminates in a sharp spine, with which it inflicts a nasty sting, causing intense pain.

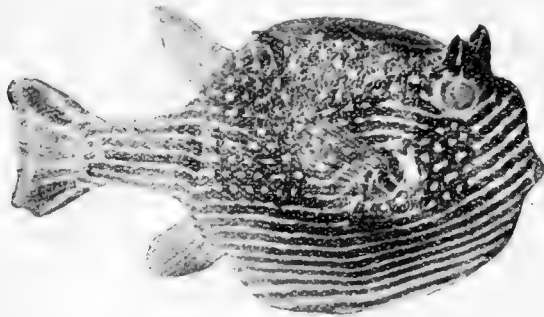
THE STONE-LIFTER

(*Kathestostoma lere*)

is popularly supposed to possess the power of turning over stones for the purpose of finding its food, but this is doubtful. The top of the head is covered with very hard plates, which would certainly withstand a great



pressure. It is a ground fish, and attains a size of 2 or 3 feet, when it is a horrible-looking fellow. It belongs to the family of "Star-gazers," so called from the peculiar position of the eyes, which are always turned upwards. It is seldom eaten, owing, doubtless, to its repulsive appearance, but in flavour the flesh resembles that of the Flathead.



THE COW FISH.

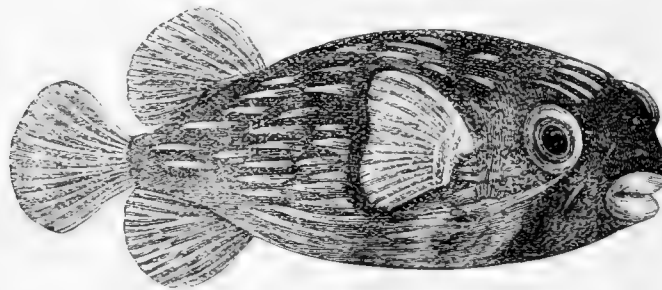
(*Ostracion ornatus*.)

The illustration represents the female; the male being very similar in shape, but very different in colouration. Instead of the light-coloured bands being covered with beautiful iridescent spots, showing all the colours of the rainbow, and being sometimes called the "Peacock Fish." It does not exist in numbers in all parts of the coast, the only place where the specimens for the

Aquarium can be obtained being from Western Port. It is very hardy, feeding well, and living for a long time in captivity. It derives its common name from the two horny excrescences growing on the top of the head. The male, with age, acquires a pronounced Roman nose. The whole of the body is merely a hard carapace, with the exception of the space occupied by the intestines.

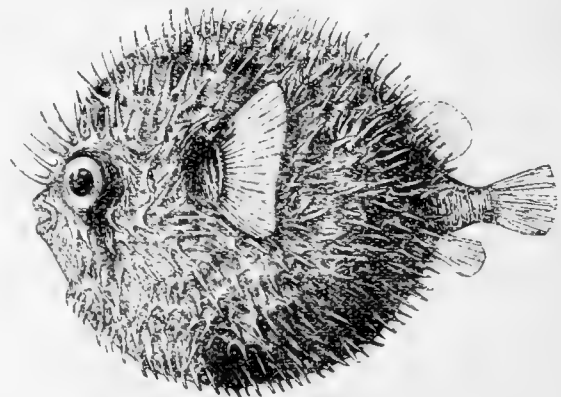
THE PORCUPINE.

(*Diodon histrix*.)



This common species is well known to all who have ever watched the fishermen landing their seine nets on the beach. The minute it is landed on the sand it inflates itself like a bladder, the spines sticking out in all directions, at the same time grinding the teeth as if in a dreadful rage.

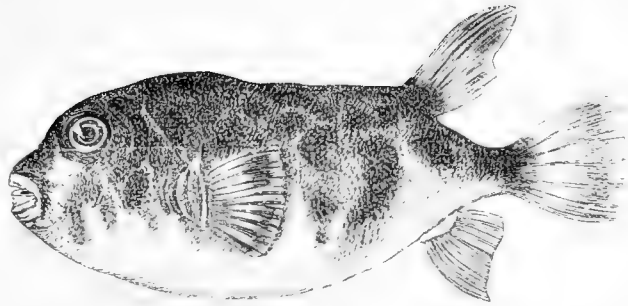
The teeth are really bony jaws with immense strength, and evidently used for detaching its food, which consists of shell-fish, &c., from the rocks. It is also peculiar in having very flexible eye muscles, being able to roll its eyes about in a manner very uncommon amongst members of the finny tribe. The Rev. Tenison Wood states that he has seen the blacks devour the liver of this fish with great gusto. However this may be, the rest of the fish is poisonous.



THE TOAD FISH

(*Tetrodon hispidus*)

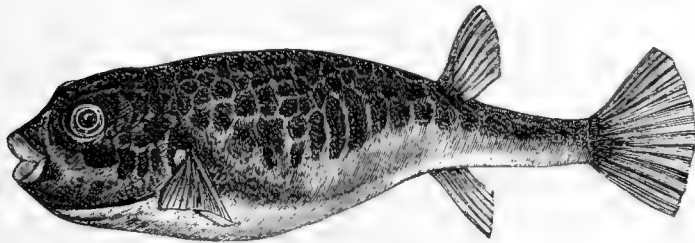
Is commonly caught all along the coast, amongst the rocky or stony grounds. Its food is principally shell-fish, and, like the Porcupine Fish, it is furnished with strong teeth for the purpose of crushing shells, &c. It has the unfortunate capability of distending itself into a round ball or bladder when landed on shore, and so becomes the sport of cruel boys, who wait until it is fully distended, and then jump on it to hear it go "pop." The skin is covered with minute spiny asperities, and the colour is dark-green, mottled with black on the upper parts, the belly being white.



THE TOAD FISH.

(*Tetrodon Hamiltoni*.)

This is one of the commonest fishes in Hobson's Bay. At certain seasons it can be seen in thousands along the beach between Sandridge and Picnic Point. The upper part of the body is of a velvety appearance, mottled with black and white spots; the belly is of a pinky-white colour. Its common name amongst the fishermen is the "publican," owing doubtless to its rotund and rubicund appearance. It is decidedly poisonous, and several cases are known where children have died from eating it by mistake.

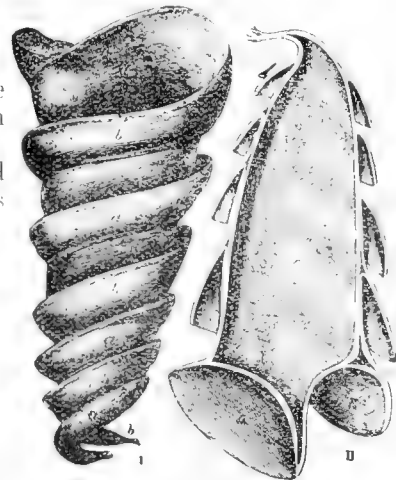
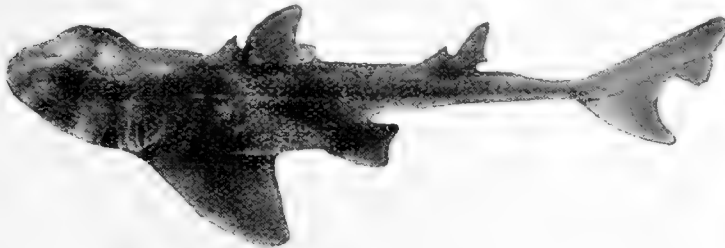


THE PIG FISH.

(*Cetracion Heterodontus*.)

This fish is oviparous. The egg, of which an illustration is here given, is pyriform, with a ridge twisted around it, and 4 inches in length.

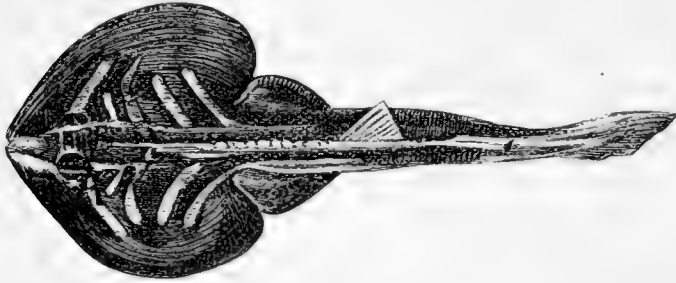
The Pig Fish is familiar to most persons who have wandered along the shores of Port Phillip. It is mostly nocturnal in its



PIG FISH EGG.

habits, and lives on all kinds of shell-fish. Its jaws are covered with laminated plates of great hardness, which are specially adapted for crushing up mussels and other shell-fish. Mr. Saville

Kent has found them very destructive to oyster-beds. They are very tenacious of life, and have been brought alive from Picnic Point to the Aquarium wrapped up in a wet bag. Several specimens are always kept in the large tank in the Stalactite Cavern.



THE FIDDLER.

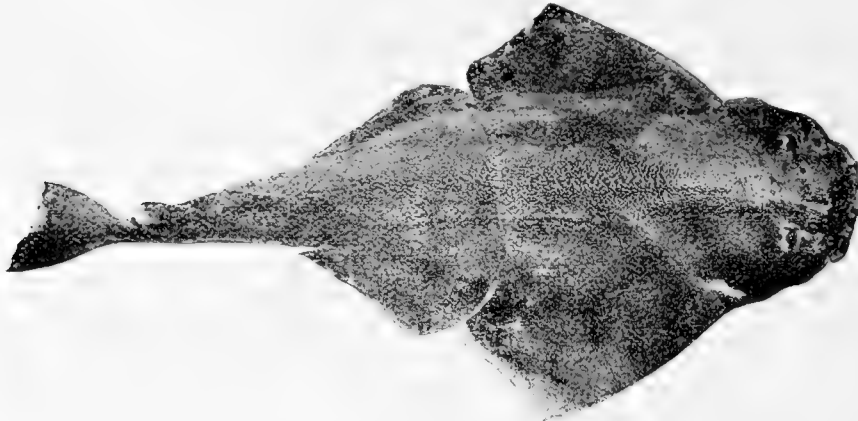
(*Trigonorhina fasciata*.)

This fish belongs to the Shark family, but has no vicious propensities. It lives on the bottom, and feeds on shell-fish and crustacea. It is very tenacious of life, and is cordially hated by the fishermen in the Bay, as it is almost omnivorous in the way of baits. Like

all members of the Shark family, it is very keen of scent. The mouth is situated on the under side, about 3 inches from the end of the snout, and when the fish is seen swimming up against the glass, presents a very comical appearance.

THE ANGEL SHARK

(*Squatina Angelus*)



Is doubtless so called from the resemblance of its side fins to wings, or the name is chosen on the "*lucus a non lucendo*" principle, as it is as ugly a customer as is to be found.

THE THORNBACK RAY.

(*Raja Punctata*.)

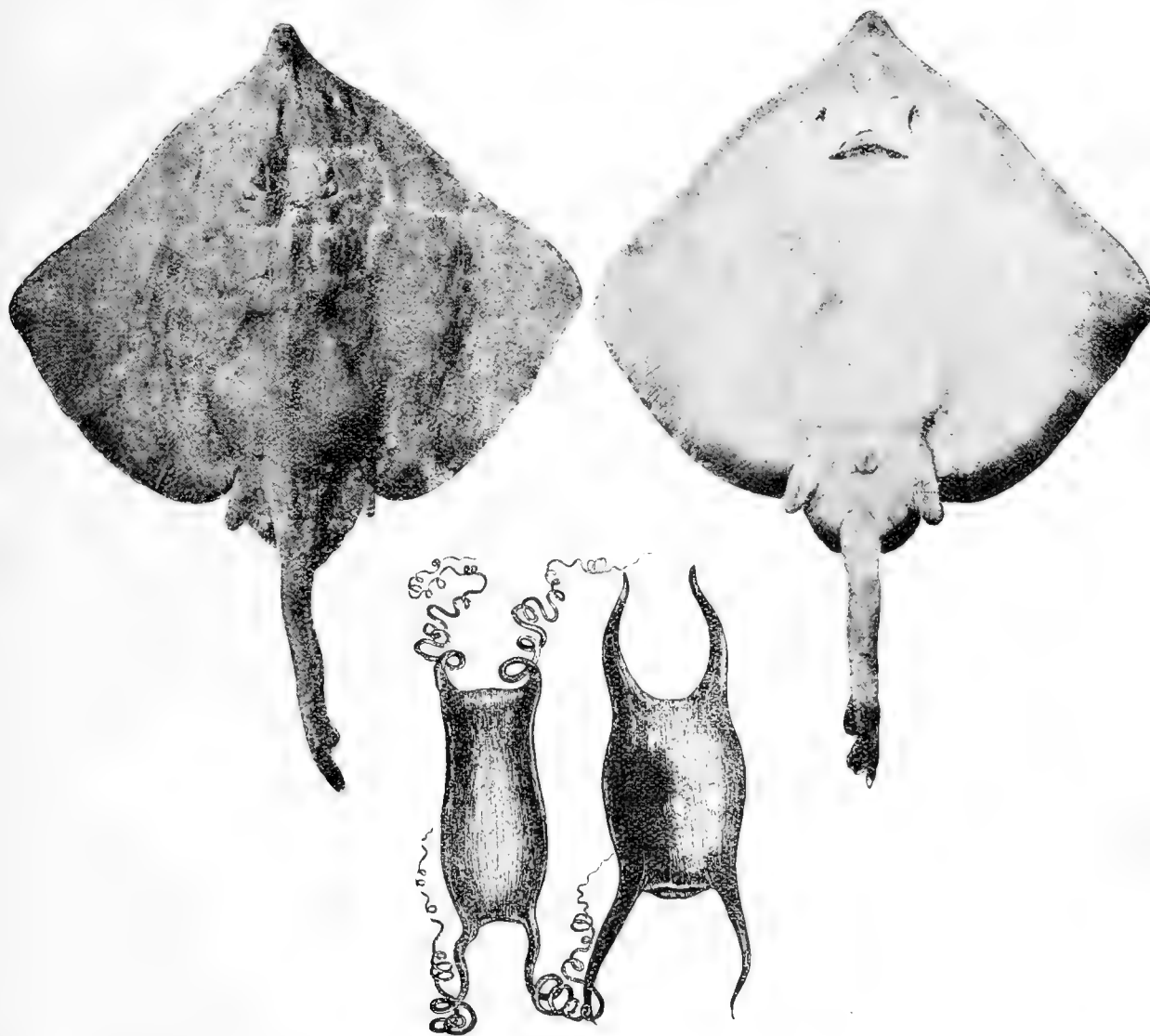
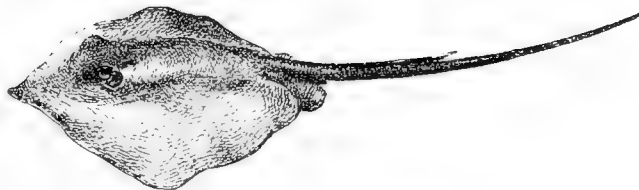


There are numerous varieties of Rays, different specimens of which are shown in the tanks from time to time. When swimming they present a very interesting sight owing to the graceful wavy motion of their fins.

THE STING RAY.

(Trygon violaceus.)

In this variety the tail is furnished with a serrated bone or sting with which the fish can strike any object over its back. The sting causes a nasty wound, which is difficult of healing. Some very large Sting Rays are found—some of them weighing over a couple of hundredweight.



SKATES' EGGS

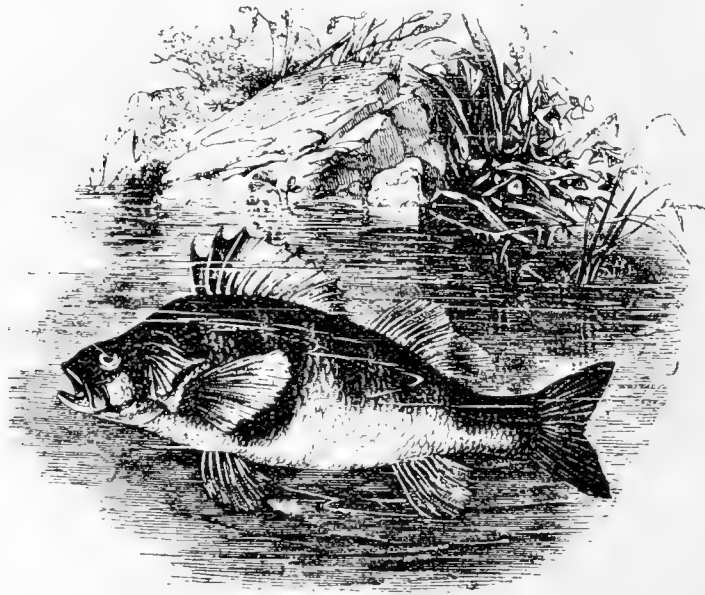
The Skates and Rays produce their young in egg-cases or capsules. These are furnished with long tentacles, evidently to enable them to moor themselves to sea-weed or some such object.

MURRAY COD.

(Oligorus Macquariensis.)

This fish abounds in the Murray and its tributaries. It grows to a large size, having been known to weigh 120 lbs. It forms an important item of food to the aborigines and to the swagmen, who when going on the "wallaby" on the river never forget, as a part of the equipment, a stout line and a supply of hooks.

THE PERCH

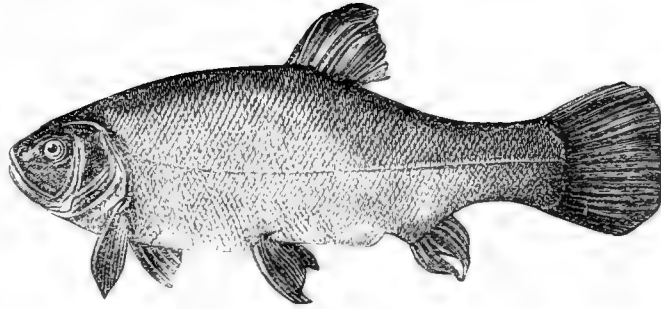
(Perca fluviatilis)

Has been acclimatised, and may now be found in nearly all our fresh-water lakes and rivers. It gives very good sport with the rod and line, and in the season is not to be despised for table purposes.

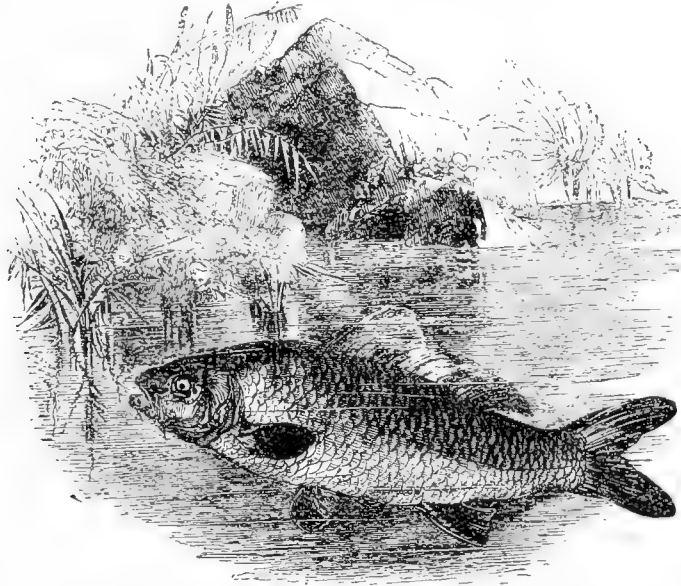
THE TENCH.

(Tinca tinca.)

This is one of the fresh-water fish that has been introduced from Europe, and successfully acclimatised here. The colour is a dark sage-green. It prefers stagnant water, with a soft muddy bottom, and is not esteemed as an article of food, the flesh being soft and of a muddy taste. It is extremely prolific, 297,000 ova having been counted in one female. Its spawn is of a greenish colour.

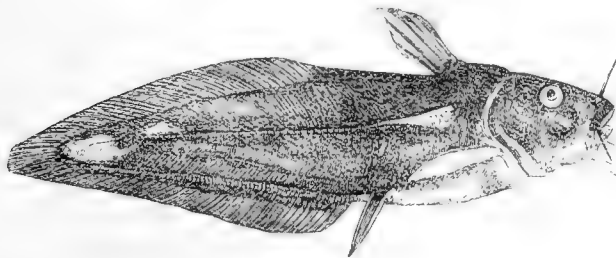


THE CARP.

(Cyprinus carpio.)

Another acclimatised fish, which, with age, grows to an immense size. Bloch mentions one taken in the Oder which weighed 70 lbs. It becomes very tame if kept in ponds, and will soon learn to take food from the hands of any one who is well known to it.

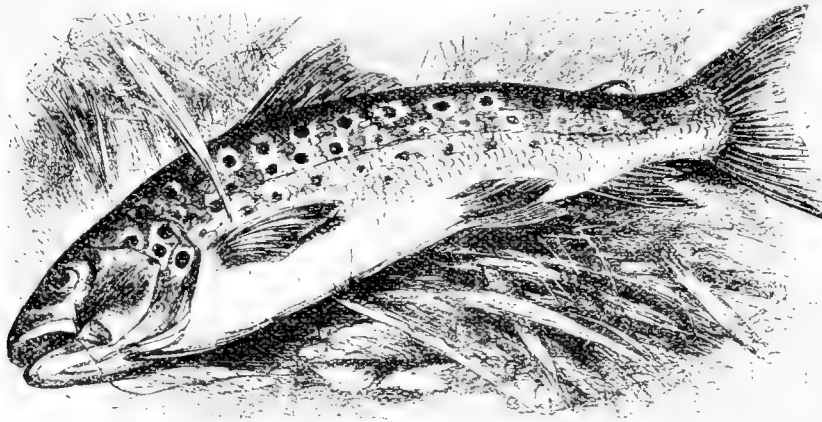
THE CAT FISH.

(Coptodoglanis tandanus.)

One of our native fresh-water fishes, found principally in the Murray, where it is pretty plentiful. The flesh is good for eating, but its repulsive appearance prevents it being much of a favorite with the public. The colour is generally a dull olive-green, tinged with brown; but it varies very much, scarcely two specimens being found exactly alike.

THE BROWN OR LAKE TROUT.

This fish has been successfully acclimatised in Victoria. The process of artificial fish-breeding is a most interesting one, and one that should be more largely pursued than it is. The



process briefly is as follows:—In the spawning season the female fish is caught and the ova exuded into a shallow basin or dish containing water, in the manner as shown in the sketch. The milt of the male fish is then pressed into the dish over the eggs in the same way, and mixing with the water is gently brushed over and amongst the eggs with a feather, and by this means they are quickened. They

are then placed on shallow trays containing well-washed fine gravel, and a constant stream of fresh water is run over them for six weeks, when the process of hatching is completed; the fish, when hatched, producing the appearance of a tiny fish attached to a bladder about the size of a pea.

The umbilical appendage is retained for a few days, until the young trout has absorbed the nutriment therein contained, and swims about the shallow tray a perfect little fish, living for a few weeks on grated boiled liver, until strong enough to be moved into a small pond with running water, where they are kept until they are three or four months old, when they are fit to be set loose in a suitable lake, river, or creek.



STRIPPING A TROUT.

The specimens of English Trout which can be seen disporting themselves in the pond in the Fernery were hatched from ova obtained from the Ballarat Fish Acclimatisation Society, who have been extremely fortunate in their operations, as the following memorandum will testify :—

The society has been in existence 25 years, and received their first consignment of Trout ova from Tasmania on the 25th of August, 1871, and for some years afterwards continued to import ova from Tasmania and from New Zealand. About 1882 they commenced stripping themselves, and have been doing so every year since with remarkable success, while occasionally importing 10,000 and 20,000 from Tasmania or New Zealand. During the past season the society distributed to all parts of the colony no less than 22,750 yearling Trout, 1,530 English Perch, and 33 Carp and a large number of English Tench. The stripping season commences the end of June, and generally lasts until the first week in August; the ova hatches in from 70 to 75 days; the fry are kept in ponds and at first fed regularly every morning, and afterwards morning and evening till the following May, when they are distributed to suitable waters as yearlings. In the society's hatcheries are sixteen boxes, each containing four trays on which the eggs are placed, and over which a stream of filtered water is kept constantly running; from these trays the young fry work their way into the rill running down the centre of the hatching-house, through which also a stream is constantly passing, and from here they are removed to the pond from which they are distributed. 400,000 eggs can be hatched annually in the hatchery. Every year the applications for fish are increasing. The society is carried on by a committee of gentlemen :—E. Morey, Esq., M.L.C., president; Dr. Whitcombe, vice-president; J. Noble Wilson, Esq., Alex. White, Esq., C. C. Stropie, Esq., J. G. Macdonald, Esq., David Cooke, Esq., T. H. Thompson, Esq.; G. Perry, Esq., hon. treasurer; Chas. Taylor, Esq., hon. secretary.

The hatchery and rearing ponds are in the Botanical gardens. The society is called the Ballarat Fish Acclimatisation Society. The ponds are supplied with water from the lake by wind-mill.

The artificial hatching and acclimatisation of fish is a most fascinating and interesting pursuit, and it is a great pity that it is not more universally pursued than it is at present. There

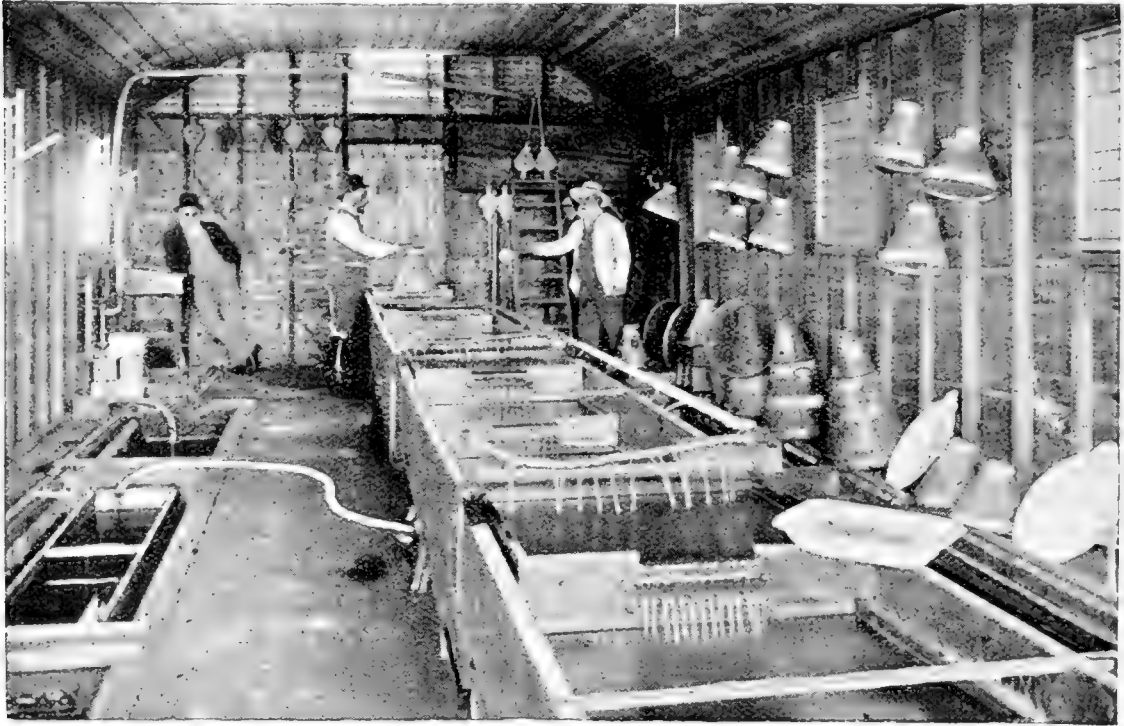


THE TROUT PONDS AT BALLARAT.



HATCHERY AT LOVELY BANKS, GEELONG.

is no reason why every river, creek, and lake in Victoria should not teem with Trout; and gentlemen residing in country towns close to a river might easily form fish acclimatisation societies, and proceed to stock the waters in their immediate neighbourhood. The following sketches of the



hatchery at Lovely Banks, Geelong, will show that a very small expense is necessary, as, if suitable ponds are available for keeping the breeding fish before stripping, a bark or paling shed will do equally well to cover in and protect the hatching trays as the more pretentious weatherboard building. Such ponds are best situated at the mouth of any small rivulet or creek flowing into a lake, as the fish naturally ascend running water when spawning time arrives. They can then be entrapped and kept until quite ripe for stripping; in the same way the fry after being hatched in the trays as above would gradually be let into a small channel of flowing water and kept under close supervision, and fed regularly every day on grated liver until strong enough to be let out into ponds (through which a current must always flow). Here they may be kept and fed until it is desired to send them away to distant waters or let them find their way into adjacent river or lake. Whilst small they must be protected from the attacks of birds or they would soon become a prey to the members of the Kingfisher tribe; the Laughing-jackass is a most expert fisherman, and like many of his fellow colonists does not disdain the toothsome imported article. This protection is well effected by stretching twine across the ponds as is seen in the following sketch, which is a picture of the ponds at Ercildoune, which were laid out by the late Sir Samuel Wilson, who took a great interest in the acclimatisation of English Trout. Should any country visitors to the Aquarium be led by the sight of the "spotted beauties" in the Fernery ponds to remember that they have in their vicinity a creek or lake into which they would desire to introduce the Trout, I shall have much pleasure in placing them in communication with the proper persons from whom fry can be obtained for distribution. Already the Watts River at Healesville is becoming quite an angler's resort, also Woodend, and numerous other country townships would be greatly benefited if they could boast of a good Trout stream in their neighbourhood.



REARING PONDS AT EROILDOUNE.

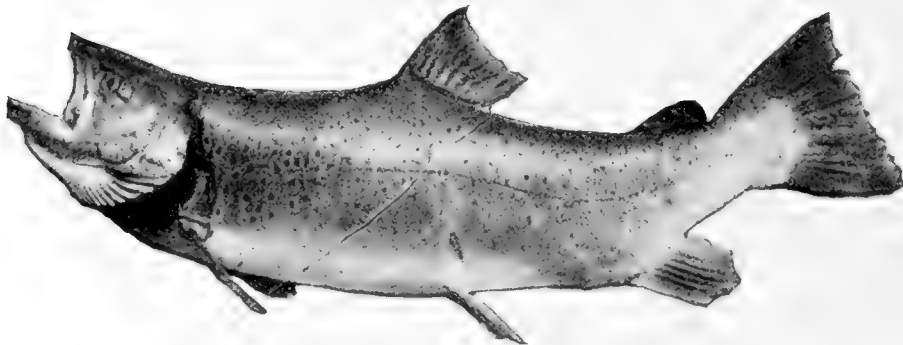


REARING PONDS, LOVELY BANKS.



LIBERATING TROUT FRY IN THE SALTWATER RIVER.

(From a photograph supplied by Mr. J. Scott, Bourke-street.)



ENGLISH TROUT CAUGHT IN THE YARRA BY MR. T. ANDERSON, 10TH DEC., 1895.

Weight, 13lb. 15oz.; length, 35 inches; girth, 17 inches.

MOLLUSCA.

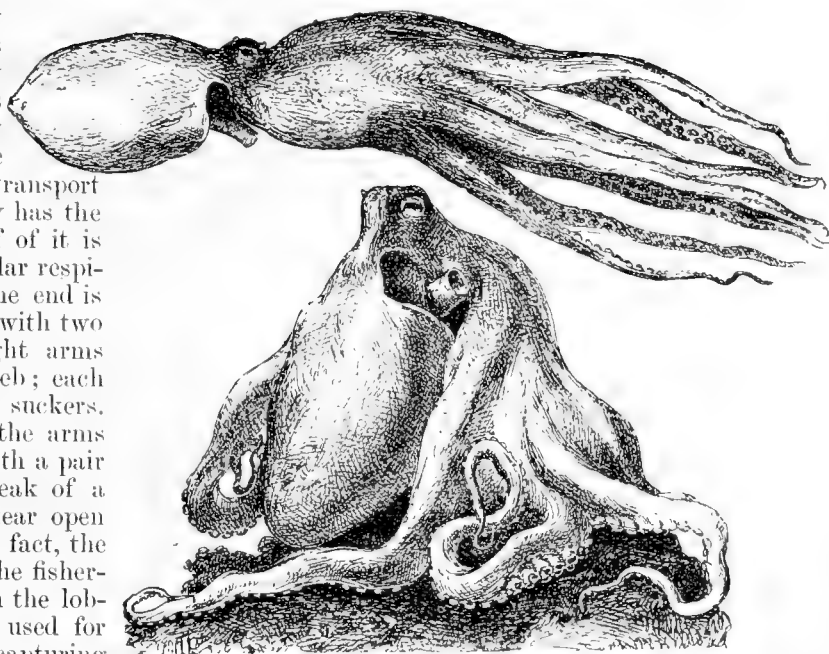
The term mollusca, *i.e.*, soft-bodied animals, is applied to snails, slugs, polyps, bivalves, and their allies, because they have no skeleton which enters into the mechanism of their movements; neither an internal one like that of the vertebrates, nor an external one like that of many of the crustacea. Most mollusca are provided with a shell, and have a head very distinctly marked off from the body, and bearing eyes and tentacles.

Cephalopoda or head-footed, to which all the octopus and squid family belong; *Gasteropoda* or belly-footed, such as the whelk, periwinkle, limpet; *Conchifera*, shell-bearing, such as the oyster, mussel, clam.

THE OCTOPUS.

(Octopus vulgaris.)

It is only occasionally that specimens of this curious creature are on view in the Aquarium, as it is only caught about the rocky fishing grounds about the Heads, and is difficult to transport without injury. The body has the form of a round bag, half of it is hollow and performs regular respiratory contractions. At one end is a toad-like head, provided with two large eyes, and with eight arms united at their base by a web; each arm bears two rows of suckers. Hidden in the middle of the arms is the mouth, furnished with a pair of jaws resembling the beak of a parrot, with which it can tear open the shell of a lobster. In fact, the specimens brought in by the fishermen are generally taken in the lobster pots. The arms are used for crawling about and for capturing its food, their under surface is covered with multitudinous suckers, and any person who has once felt the clasp of one of the tentacles can vouch for their wonderful strength.



The following cutting from the *Argus* gives an evidence of this in Sydney Harbor:—

ADVENTURE WITH AN OCTOPUS.

A lady and gentleman attacked.

SYDNEY, Friday.

An octopus 5 feet long crawled on to a ferry-boat that was running in the harbor to-night. It caught hold of a lady and gentleman, and it was ten minutes before it could be got off. It went into the water again.

Whilst the *Age* shortly afterwards published the following:—

ADVENTURE WITH AN OCTOPUS.

CAMPERDOWN, Wednesday.

The report of good fishing at Peterborough has attracted a number of anglers during the past week, and fairly satisfactory hauls have been obtained. On Saturday Mr. W. H. Wiggins, of Camperdown, had a sensational experience with an octopus. Mr. Wiggins was standing in the water intent upon the sport, when his companions, Messrs. John and James Maconachie, who were some distance away, observed a large octopus swimming rapidly towards him. They gave the alarm, and Mr. Wiggins made a rush for the shore, and after a great effort succeeded in escaping the tentacles of the monster, which upon being captured was found to measure 8 feet across.

To the same family belong the Cuttle-fish (*Sepia officinalis*), the white bone of which is so often found on the sea-shore, and the squid (*Loligo vulgaris*), which can generally be observed swimming around all the piers at the watering places. These two latter are decapods, and are so delicate in structure that but few specimens have been successfully landed at the Aquarium.

Various specimens of shell-fish can always be seen in the various tanks, and the visitor will find a most complete collection of shells in four large cases in the Museum, which are all labelled true to name and will well repay inspection.

The best known of all molluscs is the oyster (*Ostrea edulis*), which is an article of daily consumption. Great Britain is said to consume 2,000 millions annually, and on the Continent



large amounts of capital are embarked in the culture of this succulent bivalve, especially in France. The breeding of the Oyster has been carried out on an enormous scale, as can readily be imagined from the accompanying sketch of an oyster claire or park.

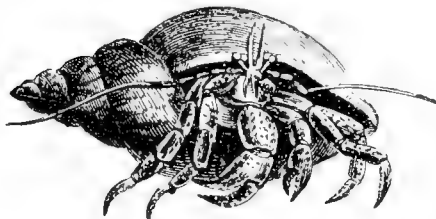
In England Oysters are kept in pits and subjected to a regular course of feeding with oatmeal, &c., to prepare them for market. Any mode of progression that Oysters may have is obtained by the opening and shutting of the shells and the ejection of the water contained. Some time back a discussion arose in the newspapers as to whether Oysters rested on the flat or round shell, but experiments were unable to demonstrate any fact except that they did both or either, at their own sweet will.

CRUSTACEÆ.

All members of this order are protected with a shelly covering, and to it belong all Crabs, Crayfish, &c.

THE HERMIT CRAB

(*Cenobita Diogenes*)



Is one of the most interesting of Nature's caprices. This gentleman, not having been provided with a house of his own, annexes a large shell which has been vacated and ensconces himself therein. As he grows he changes his habitation. When in possession of his shell he is a warlike individual; when evicted through the course of circumstances, or necessity for a change of lodging, he is most shame-faced. His hinder parts being only covered with a soft shell, which leaves him unprotected when without his shell-house. It may be noticed that the right claw is the larger, and this is used for the purpose of closing up, as with a door, the entrance to his domicile.

CRAYFISH

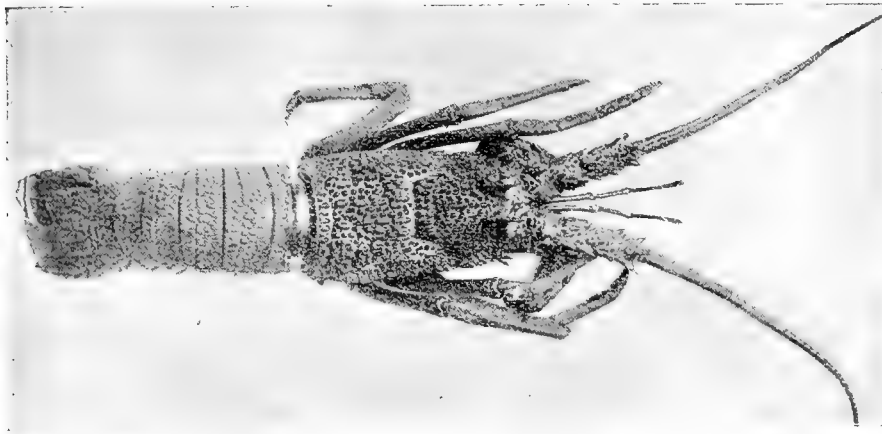
(*Palinurus Huxellii*)

Have a very different appearance alive to what they have when boiled and lying on the slab of a fishmonger's shop ready for sale. It crawls about the tanks in a stately dignified manner, as if quite insulted at the idea of being exhibited for show.

Crayfish are caught all round our coasts where there is a rocky foreshore, and form quite an important item of diet. In early summer, when the female carries the ova, the fish are at their best. The ova is known as "coral," and is esteemed a great delicacy.

Mr. E. J. Allen, B.Sc., Director of the Plymouth Laboratory, has recently devoted much time to the study of the English lobster, and in a paper on the reproduction of the lobster he gives some startling figures as to the number of eggs produced by this crustacean. He writes:—

The number of eggs laid by a lobster becomes very much greater as the age of the animal advances. This appears to be true both of the American and European species. A female 8 inches long, according to Herrick, carries from 3,000



to 9,000 eggs, whilst in one measuring $16\frac{1}{2}$ inches, the number was 85,000. As a result of an examination of nearly 8,000 individuals, this author finds "that the numbers of eggs produced by a female lobster at each reproductive period vary in geometrical series, whilst the length of the lobsters producing these eggs vary in arithmetical series."

Thus, an American lobster—

| | | | |
|------------------------|-----|-----|------------|
| 8 inches long produces | ... | ... | 5,000 eggs |
| 10 " | " | " | 10,000 " |
| 12 " | " | " | 20,000 " |
| 14 " | " | " | 40,000 " |
| 16 " | " | " | 80,000 " |

Ehrenbaum finds a similar state of things in the Heligoland lobster, although the actual number of eggs in individuals of the same length appears to be less in the European than in the American species.

The English lobster, with its large front claws, is not found in Australian waters, its nearest prototype being the prickly fresh-water Murray lobster, to which is akin the little yabbie found in all our creeks and lakes.

MURRAY LOBSTER.

(*Astacopsis spinifer*.)

Many of these Crayfish are sent to market, and are remarkably good eating. In order to prevent them fighting each other it is necessary to tie their claws with a piece of string; some of the fishermen adopt a more cruel practice of driving a small peg of wood into the joint of the claws, which prevents their use. If Crayfish suffer in the flesh like human beings they must have a real bad time, as one would have thought that boiling alive was sufficient, without anterior tortures.



There are also a great variety of Crabs, different sorts of which are seen in the tanks from time to time. The little blue Crab, which is found in such quantities on the sand when the tide is out, is a very favorite food with all the fish, so as soon as it is placed in the water it is quickly gobbled up.



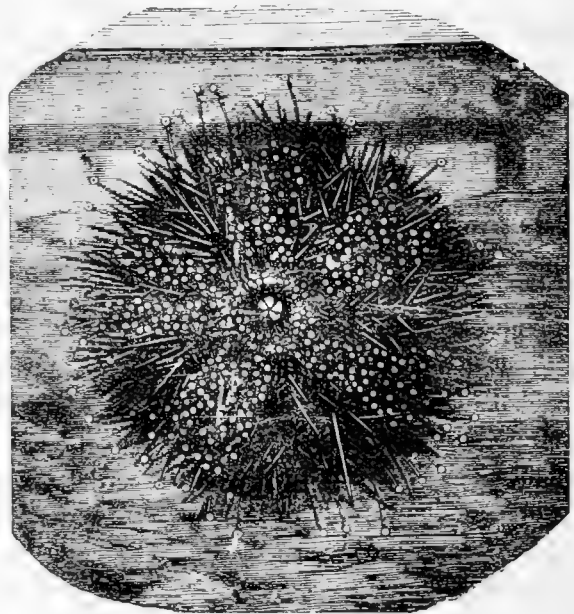
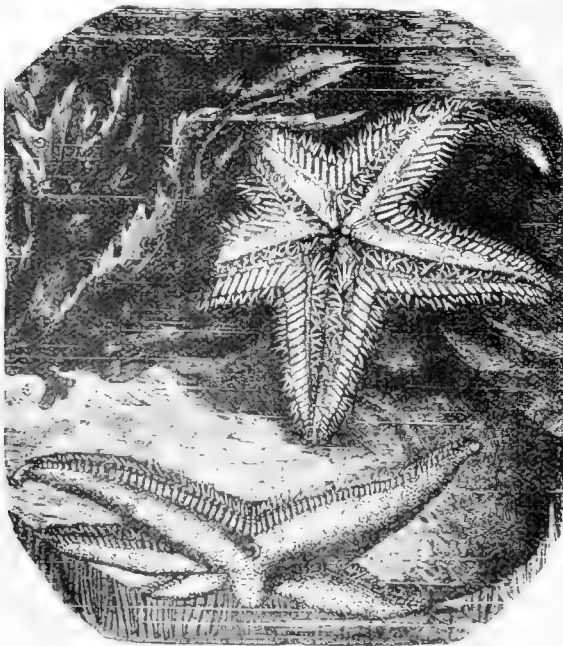
PÉRON'S IBACUS CRAB.

(*Ibacus Peronii*.)

This species is rather uncommon, but is found in Port Phillip and Western Port.

ECHINODERMATA.

To this family belong the Sea-urchins, Starfish, &c.; the numerous spikes of the Sea-urchin and the under surface of the Starfish are provided with suckers, by which they attach themselves to the rocks or other objects; an opportunity can generally be got of observing their structure minutely, as some of the specimens will generally be found attached to the glass of the tanks in which they are kept.



COMBAT BETWEEN AN OYSTER AND A STARFISH.

To look at an oyster you would never imagine that there was any fight in it, would you? No one would think an oyster could and would fight unless he had been a witness, some time or other, of the oyster's fighting qualities. One of the most exciting contests I ever saw (says a correspondent of the *New York Evening Sun*) was between an oyster and one of the most deadly enemies of the oyster family, and I am glad to say that the oyster won the fight. The enemy was a starfish, and if all of its kind were as fresh and indiscreet as this one was, they wouldn't be a source of so much dread to the oyster farmer. Every person who has anything to do with raising oysters has seen many a battle between them and starfish. These destructive enemies of the oyster grow fast, but seldom attempt to attack the bivalves before they are six months old, and then their inexperience and over-confidence are apt to get them into a heap of trouble. A starfish that has cut its eye teeth, so to speak, will get the best of an oyster every time, for it will mount the shell, drill a hole through it, inject its stupefying liquor into the oyster, and envelop the whole thing with its capacious and elastic mouth stomach before the poor shellfish knows what has happened to it. A school of starfish can go through an oyster farm almost as quickly as a tornado can wipe out a wheat farm in Dakota. Starfish are virtually walking stomachs, and I have found them stretched over clams, shell and all, that were a great deal bigger than the natural dimensions of the starfish. When one of these rapacious marauders envelops a clam or an oyster it simply turns itself wrong side out and pulls itself over its victim, as you would pull on a pair of new socks. This fight I was speaking about occurred in shallow water, and I had a good sight of it. I saw the starfish work warily along over the oyster and then settle down upon it. The bivalve was on the look-out, however, and when the starfish was near enough the oyster's shell closed like a steel trap on one of the starfish's five rays, and cut it off as slick as if it had been done with a knife. A starfish doesn't mind the loss of a ray or two; in fact, it can stand the loss of four of its rays and then make its way off, in a short time spreading and growing the lost members again. But if the starfish loses all five of its rays its doom is sealed. It will die almost immediately. The oyster had no sooner clipped off one of its foe's legs than it set its trap again, and waited for a renewal of the attack. This was not long in coming. The starfish dropped itself slowly, with so much confidence that I could almost see it, and was soon astride the oyster again. Again the trap flew shut, and the starfish rose with but three of its five rays left. But it was plucky, and, with confidence unimpaired, returned for the third round with the prompt and watchful oyster. The round was a repetition of the other two, and the starfish was bereft of another leg. The persistent enemy of the oyster had apparently set its mind on having that particular one, and without a moment's hesitation turned its crippled body to the fourth assault. The oyster was now mad all the way through, and shifted its position, turning its open shell upward as the starfish dropped toward it. This was the last round of the fight, for the oyster caught both remaining rays of the starfish in the trap, and snipped them off at one bite. The rayless starfish turned over and sank to the bottom dead.

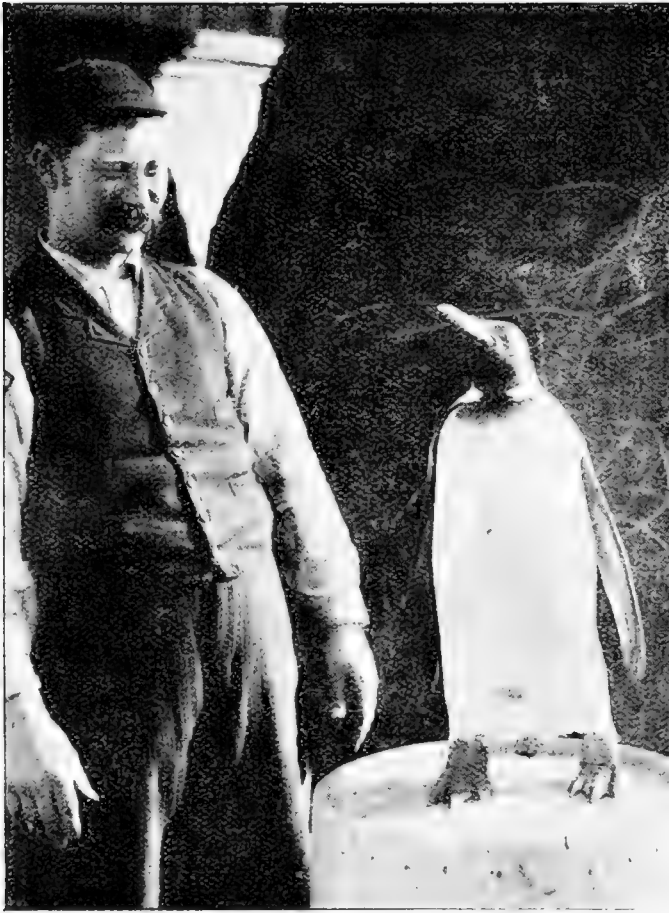


THE SEA BIRDS.

Amongst the most remarkable will be found the King Penguins, which come from the Macquarie Islands to the southward of New Zealand, and the colder the latitude the larger these birds seem to grow, till at the South Pole they attain a height of 4 feet and a weight of 70 or 80 lbs. When they are of this size they are largely taken for the oil they yield. In these birds nature has modified the wings into flippers, apparently only of use for swimming on the water.

Mr. Hatch, of Invercargill, N.Z., sends a yearly expedition out to procure penguin oil, which is universally admitted to be the best oleaginous substance for the treatment of the twine used in the reaper and binder machines; on his return from his last trip Mr. Hatch gave the following account of the islands, which was reproduced in the weekly press, as were also the photographs given below:—

To the south of Stewart Island lie the Macquaries, Snares, Auckland, Campbell, Antipodes, and Bounty islands. On all of these penguins and other sea birds abound. The Macquaries are in lat. 54 deg. 45 min. south, and 158 deg. 56 min. west longitude, distant 850 miles from Hobart, and belonging to Tasmania. Mr. Joseph Hatch has the unique honour of possessing the most southern manufactory in the world, having at great expense and risk succeeded in establishing a flourishing oil industry in the largest of these remote islands. The penguin life on the Macquaries is simply marvellous, countless millions congregating together in their rookeries like so many regiments. Our illustrations, which are from original negatives specially made for Mr. Hatch, give but a faint idea of the immense areas covered

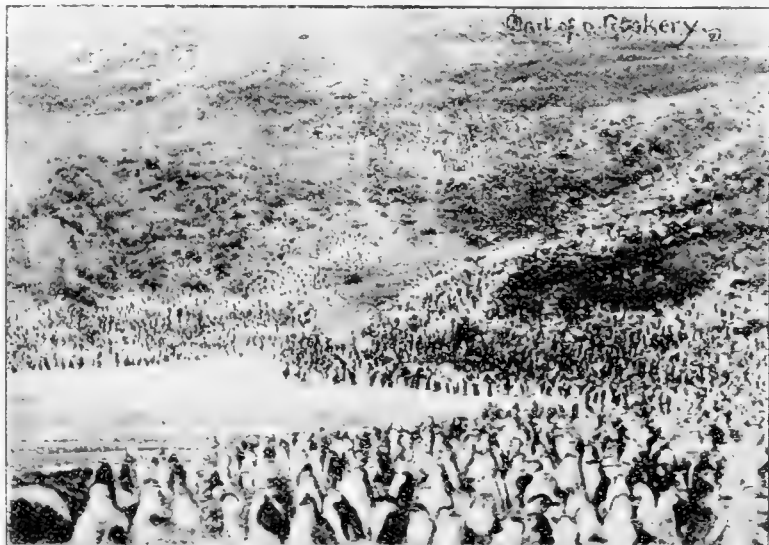


KING PENGUIN AND KEEPER

depôt inscriptions tell of the sufferings of the eight men. They were 91 days on the island, ten of these without fire or any food, save shell-fish, and across a deep angry channel they could see the dépôt at Erebus Cove, where were food, fire, and clothes—beyond their reach. The survivors were eventually rescued by the timely arrival of Mr. J. Hatch's schooner *Avarua*. There are many fine water-falls to be found in the Auckland Islands, dashing over the bold cliffs, and sometimes when a high wind is blowing being dissipated into spray before they can reach the ground. Sea lions are here numerous and comically unwieldy. Albatrosses abound here, and the penguins, as a steamer approaches, may be seen on the rocks drawn up like a regiment of soldiers.

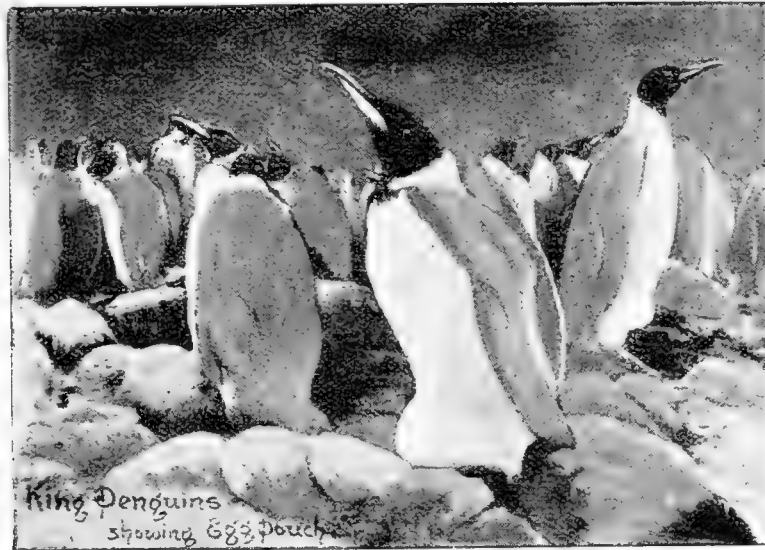
The Antipodes Islands were the resort of the Sydney sealers. They rise abruptly from the sea to a height of 1,200 feet, with perpendicular cliffs varying in altitude from 200 to 600 feet. The island proper is about 3 miles long,

by these quaint-looking birds. A "rookery" is generally 30 or 40 acres in extent, and there are numerous rookeries distributed over the island. The "king" penguin is the giant of the species, standing over 3 feet in height. Penguins are exceedingly tame and inquisitive, and will follow one about like a lot of very big domestic poultry. Sea elephants are to be met with here, averaging from 12 feet to 20 feet in length and 5 feet to 6 feet across the widest part of the back. These great sluggish brutes are not nearly so active as seals or sea lions. Mr. Hatch has succeeded in turning all this hitherto useless material to good account, and for years past has been boiling down countless thousands of penguins and sea elephants, converting them into oil, chiefly for use by rope and binding twine manufacturers. Mr. Hatch talks of extending his energies to the Auckland Isles, with a view of establishing a sheep run there, so that these unknown lands will all be occupied, and shipwrecked mariners have more hope of succour than was obtainable in years gone by. Mr. Hatch possesses a fine series of views of penguin life on the Macquaries, and with a number of live birds and sea elephants contemplates touring the colonies. At a private view recently given in Invercargill the pictures aroused more than ordinary attention, and as an intrinsic object-lesson such an entertainment has much to commend itself. The Auckland Islands were discovered in August, 1806, by Captain Bristow, who named them after Lord Auckland, and formal possession was taken of them in 1807. They are very mountainous, the altitude of the ranges being from 950 feet in the north to 2,000 feet in the south. On the rocky coast many wrecks have occurred, the *Invercauld*, the *Grafton*, the *General Grant*, and the *Derry Castle*, besides others of which we know nothing. Many traces of the wrecks are still to be found there. The canoe built by the survivors of the *Derry Castle*—a wonderful example of perseverance and patience—is yet to be seen, and inside the



PART OF A PENGUIN ROOKERY.

egg shaped, and surrounded by precipitous black rocks, in which there are a great many sea-formed caves. Penguins and paroquets abound. Mount Galloway, the principal hill, is 1,200 feet above the level of the sea. On the summit there is a beautiful clear lake covering an area of 13 or 14 acres, much frequented by albatrosses. No bush or native scrub is to be found here, but at different times, when the Government steamer has visited these islands, grass seed



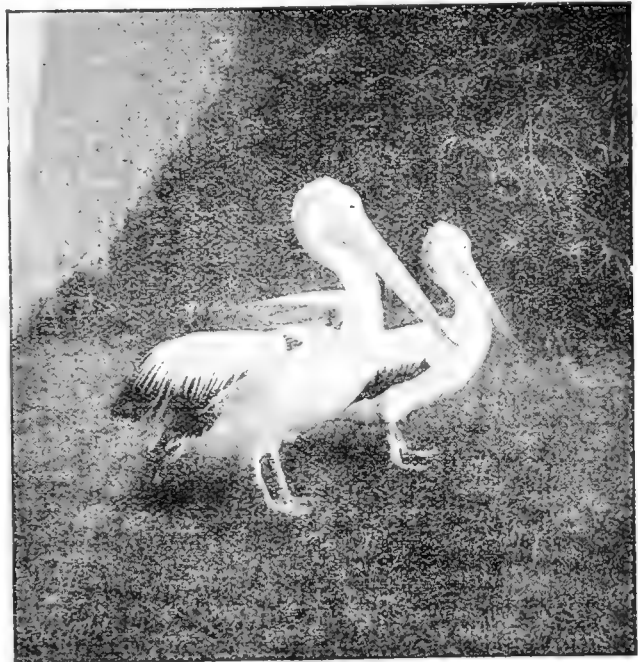
KING PENGUINS, SHOWING EGG POUCH.

has been sown and trees planted. On a ledge of rock on this island was found a board, evidently marking a grave, with the following inscription:—"To the M—Foster, chief officer of the Schr. *Prince of Denmark*, who was unfortunately drowned—ke Boat Harbour, 14th day of December, in the—1825." No fewer than 70 years ago this island had been visited by what was doubtless a sealing schooner, and this was the memento of one who had perished while endeavouring to "make" this difficult harbor.

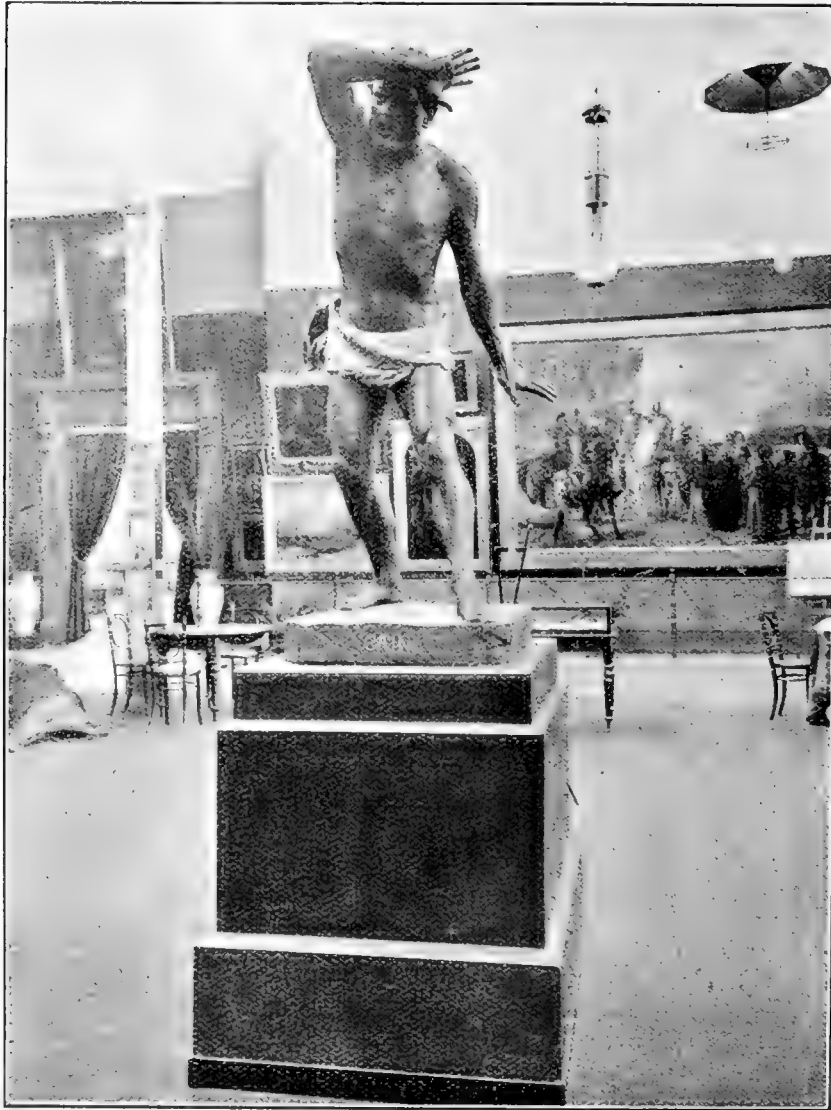
PELICANS.

These birds are caught on various shallows along the coast, where they will generally be seen in solitary state on extreme points of land or sand banks. They are most assiduous fishermen, and, when not disturbed, are said to frequent the same spots year after year. In confinement they become very tame, and are quite a feature of the show at feeding time.

Gannets, gulls, and other varieties of sea birds will also be seen in the pond.



THE PICTURE SALON



Is situated immediately to the right of the porch on entering.

Most of the pictures in the salon are loaned by the Hon. L. L. Smith.

- | | | | | | | | | |
|---------------------------------------|---|---|---|---|---|---|---|-----------------------|
| 1. The Enthusiast | - | - | - | - | - | - | - | <i>J. N. Barclay.</i> |
| 2. Return from the Chase | - | - | - | - | - | - | - | |
| 3. Hawking Party | - | - | - | - | - | - | - | |
| 4. Bridge on the Tiber | - | - | - | - | - | - | - | |
| 5. A Saint | - | - | - | - | - | - | - | <i>Spagnoletto.</i> |
| 6. Birds and Poultry | - | - | - | - | - | - | - | <i>Hendicooter.</i> |
| 7. Judith with the Head of Holofernes | - | - | - | - | - | - | - | <i>Carl Kahler.</i> |

Judith, widow of Manasses ; a Jewish heroine of great beauty, virtue, and courage, whose history is given in the book which bears her name, the author and age of which are unknown. The Catholic Church admits it into the canon, but it has generally been considered apocryphal by Protestants. Judith is represented as going out to the tent of Holofernes, an Assyrian general who was besieging Bethulia, charming him with her beauty, and taking advantage of the admission to his tent to cut off his head with his own sword while he slept.

8. Nero at the Burning of Rome - - - - - *B. W. Haydon.*

B. W. Haydon was born on 25th January, 1786. His whole life, which he devoted assiduously to the cultivation of the art of painting, was a struggle against financial adversity and a non-recognition of his undoubtedly great talents; in fact, he was 50 years before his time. The "Nero Playing whilst Rome is Burning" and "The Banishment of Aristides" were two of his great frescoes designed for the ornamentation of the corridors of the British House of Parliament, Westminster, a set of seven being intended to typify the various forms of government. After a life of struggle and disappointments, Haydon at last committed suicide.



NERO AT THE BURNING OF ROME. (Loaned by Hon. L. L. Smith.)

9. Flight of the Israelites from Egypt - - - - -
 10. Australian Sunset - - - - - *Carl Kahler.*
 11. Coliseum - - - - - *Zuccarelli.*

The ruins here depicted are the remains of a gigantic building in Rome which was 1,612 feet in circumference and contained 80 arcades, and was the greatest amphitheatre which Roman magnificence ever erected. It was built by Vespasian, and was said to have been built in one year by the compulsory labour of a vast number of slaves, principally Jews and Christians. It is said to have held 110,000 spectators, of whom 90,000 were seated. It derived its name from the colossal statue of Nero erected therein. Although erected under Pagan rule, it is the most remarkable monument to Christianity existent, as the tortures to which the early Christian martyrs suffered in its arena, rather than abjure their faith, will be spoken of as long as the world endures.

12. The Martyr - - - - - *T. Schwartz.*
 13. The Betrayal of Christ - - - - - *Flandering.*
 14. Death of Mazeppa - - - - -
 15. Portrait of Rembrandt's Wife - - - - -
 16. The Nativity - - - - -

17. Portrait of Rembrandt - - - - -
 18. Apollo and Python - - - - - *Pietro Bendenut.*

Many competent critics have drawn special attention to this picture. Its anatomy is perfect and the flesh work inimitable.

19. Effect of Light - - - - -
 20. Worship of the Bull - - - - -
 21. David with the Head of Goliath - - - - -
 22. Cattle - - - - - *Berghem.*



THE NEWS SELLER'S SHOP.

23. Battle Scene - - - - - *Hughtenburg.*
 24. A Medical Conference - - - - -
 True portraits of the Medical Society of England.
 25. Classic Painting - - - - -
 26. The Ascension - - - - -
 27. Cupid's Dart - - - - -
 28. St. Ambrose repulsing the Emperor Theodosius from Milan Cathedral
 29. The Fortune Teller - - - - - *Valentine.*

- | | | | | | | | | |
|---|---|---|---|---|---|---|---|---------------------|
| 30. The Old Mill | - | - | - | - | - | - | - | <i>Stanfield.</i> |
| 31. Infant Saviour and Angels | - | - | - | - | - | - | - | |
| 32. Masquerade | - | - | - | - | - | - | - | <i>O. Orfei.</i> |
| 33. Landscape and Horses | - | - | - | - | - | - | - | <i>T. Barker.</i> |
| 34. Portrait of the late H. H. Hayter, Esq., C.M.G. | - | - | - | - | - | - | - | <i>J. C. Waite.</i> |
| 35. Massacre of the Innocents | - | - | - | - | - | - | - | |



"CUPID AND PSYCHE." (Loaned by Cr. J. Dynor, J.P.)

36. Deucalion and Pyrrha - - - - -

In fabulous history, Deucalion, father of Hellen, ancestor of the Hellenes, was the son of Prometheus and Pandora. In his time was the celebrated flood—the deluge of Deucalion, 16th century B.C.—which is thus described in the fable:—"Jupiter, determining to destroy mankind by water, on account of their impiety, brought a flood upon the earth by means of a violent rain." Deucalion saved himself and his wife Pyrrha on top of Mount Parnassus. After the flood had subsided they consulted the oracle of Themis to know what they must do to repair the loss of mankind, and were directed to throw behind them the bones of their mother; understanding their mother to signify the earth, and her bones the stones, they did as the oracle directed. The stones thrown by Deucalion became men and those thrown by Pyrrha women, and so the earth was re-peopled. There are many circumstances narrated in the fable which bear a resemblance to the account in the Scriptures of the Deluge.

37. The Wizard - - - - -

38. Noah sending forth the Dove from the Ark - -

"And the dove came in to him in the evening; and lo, in her mouth was an olive leaf plucked off; so Noah knew that the waters were abated from off the earth."—Gen. viii. 11.

39. Girl's Head - - - - -
 40. A Terrible Story - - - - - *Cattermoll.*
 41. Changing Pasture - - - - - *J. H. Sheltema.*
 This is a truly Australian scene. Here we see the flock of sheep slowly grazing over the rise to seek the lower pastures.
 42. Portrait of the Hon. L. L. Smith, L.S.A., F.R.G.S.L., F.S.A. - *Tom Roberts.*
 43. The Cobbler - - - - -
 44. The Wayfarer - - - - - *Vanderburg.*



45. Un Billet de Logement - - - - - *Girardet.*

It used to be the custom when troops were marching, on arrival at a town, for the soldiers and officers to be compulsorily quartered on the inhabitants, receiving a ticket or "billet" for presentation to the master or mistress of the house. In the picture before us the officer has just presented his ticket or "billet de logement" to the lady of the house, who cannot help noticing the ardent glances that the warrior throws on the pretty daughter, and is no doubt inwardly perturbed at the advent of this hawk into her peaceful dovecot.

46. News-vendor's Shop - - - - - *O. Orfei.*
 47. Landscape, Water colour - - - - - *Murray.*
 48. Dutch Interior - - - - -
 49. An Irish Wake - - - - - *T. Bridgford, R.A.*
 50. Fruit - - - - - *W. Etty, A.D. 1847.*
 51. Infant Cupid - - - - -
 52. Cottage Scene - - - - - *Constable.*
 53. Portrait Hon. T. Bent, as Speaker of the Legislative Assembly - *C. E. Gordon Fraser.*
 54. A Clandestine Meeting - - - - - *Carl Kahler.*

| | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|-------------------------|
| 55. Man's Head - | - | - | - | - | - | - | - | - | - |
| 56. Cupid's Dart | - | - | - | - | - | - | - | - | - |
| 56A. A Spring Morning near Fernshaw | - | - | - | - | - | - | - | - | <i>J. Whitehead.</i> |
| 57. Landscape, Horse and Pond | - | - | - | - | - | - | - | - | - |
| 58. Dan O'Connell Lecturing | - | - | - | - | - | - | - | - | <i>B. W. Haydon.</i> |
| 59. The Hermit | - | - | - | - | - | - | - | - | <i>Salvator Rosa.</i> |
| 60. Sir Peter Scratchley in New Guinea | - | - | - | - | - | - | - | - | <i>Doyle Glanville.</i> |
| 61. The Woman Taken in Adultery | - | - | - | - | - | - | - | - | - |
| 62. St. Cecilia | - | - | - | - | - | - | - | - | - |
| 63. Mother's Pet | - | - | - | - | - | - | - | - | - |
| 64. Mother's Pet | - | - | - | - | - | - | - | - | - |
| 65. The Nativity | - | - | - | - | - | - | - | - | - |
| 66. Man and Woman Drinking | - | - | - | - | - | - | - | - | <i>After Teniers.</i> |
| 67. Mars and Venus | - | - | - | - | - | - | - | - | - |
| 68. Mars and Venus | - | - | - | - | - | - | - | - | - |
| 69. Sphynx and Pyramids | - | - | - | - | - | - | - | - | <i>Roberts, R.A.</i> |
| This picture represents a storm arising on the desert, at first a solemn stillness pervades the surroundings, a cold breath comes no one knows whence, a moaning of the wind is heard; and in a few minutes the sky is blackened by dense impenetrable all-overpowering clouds of sand. Woe betide the unfortunate traveller on the Sahara who is caught unawares. | | | | | | | | | |
| 70. The Saviour and Woman of Samaria | - | - | - | - | - | - | - | - | - |
| 71. The Descent from the Cross | - | - | - | - | - | - | - | - | <i>Rubens.</i> |
| 72. The Market-place | - | - | - | - | - | - | - | - | - |



(Loaned by the Hon. L. L. Smith.)

73. The Duke of Milan compelling the Papal Legate (afterwards Pope Urban VI.) to eat the Parchment of Remonstrance sent by His Holiness or be thrown into the river. As an historical fact he ate it, seal and all. *Giannetti.*

This valuable painting was exhibited all over the Continent of Europe. At the foot of the picture will be seen a copy of the engraving of this picture which was published in the *Graphic*.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|--------------------------------|
| 74. The Entombment | - | - | - | - | - | - | - | <i>Davens.</i> |
| 75. The Bathers | - | - | - | - | - | - | - | |
| 76. Cavaliers and Roundheads, The Battle of | - | - | - | - | - | - | - | <i>P. Mevelner, A.D. 1646.</i> |
| 77. Madonna and Child | - | - | - | - | - | - | - | |
| 78. Politics | - | - | - | - | - | - | - | <i>O. Orfei.</i> |
| 79. Card Players | - | - | - | - | - | - | - | |
| 80. Madonna | - | - | - | - | - | - | - | |
| 81. Fruit Market | - | - | - | - | - | - | - | <i>N. Stefano.</i> |
| 82. Flowers | - | - | - | - | - | - | - | <i>F. Inygens.</i> |
| 83. Crucification | - | - | - | - | - | - | - | |
| 84. Head | - | - | - | - | - | - | - | |
| 85. Touching her with Golden Sceptre | - | - | - | - | - | - | - | <i>Rembrandt, 1606-1688.</i> |
| 86. Presenting Gifts to Infant Christ | - | - | - | - | - | - | - | |
| 87. W. Crammond | - | - | - | - | - | - | - | <i>Sir W. Hamilton.</i> |
| 88. The Music Lesson | - | - | - | - | - | - | - | <i>Dow.</i> |
| 89. Christ crowned with Thorns | - | - | - | - | - | - | - | |
| 90. Classic Landscape | - | - | - | - | - | - | - | |



(Loaned by Hon. L. L. Smith.)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|----------------------|
| 91. Calcutta | - | - | - | - | - | - | - | |
| The Hoogly presents a variety of shipping unseen in other parts of the world, and forms a wonderful panorama of shapes and colours provided by the quaint-shaped vessels of the East with which it is always crowded. | | | | | | | | |
| 92. Cleansing of the Israelites | - | - | - | - | - | - | - | <i>Crojer.</i> |
| 93. Water Nymph | - | - | - | - | - | - | - | |
| 94. Banishment of Aristides | - | - | - | - | - | - | - | <i>B. W. Haydon.</i> |

Aristides, surnamed the just, was the son of Lysimachus, and descended from one of the most honorable families of Athens. He was one of the ten generals of the Athenians when they fought with the Persians at Marathon. According to the usual arrangement, the command of the army was held by each of the generals in rotation for one day. But Aristides perceiving the disadvantages of such a change of commanders prevailed on his colleagues each to give up his day to Miltiades, and to this must in a great measure be ascribed the victory of the Greeks. The year ensuing he was an archon, and in this office enjoyed so universal popularity that he excited the jealousy of Themistocles; this ambitious man, not daring openly to attack his rival, contrived to spread a report that Aristides was aiming at a kind of sovereignty, and at last succeeded in procuring his banishment by the ostracism. It is said that a rustic citizen, who happened to stand near Aristides in the public assembly which decreed his banishment, turned to him, without knowing who he was, and asked him to write the name of Aristides on the shell. "Has Aristides injured thee?" inquired he. "No," answered the voter, "but I am tired of hearing him called the just." Aristides wrote his name, and returned the shell in silence to the voter. He left the city amidst the jeers of the populace, but with prayers on his lips for its welfare. It is this scene that Haydon has transferred to canvas.



BANISHMENT OF ARISTIDES. (*Loaned by the Hon. L. L. Smith.*)



A SCENE FROM THE FRANCO-PRUSSIAN WAR.

STATUARY.

| | | | | | | | | |
|--|---|---|---|---|---|---|---|-----------------------|
| 117. Calypso | - | - | - | - | - | - | - | - |
| 118. Bust of Prince Albert | - | - | - | - | - | - | - | - |
| 119. Medallion of Fruit | - | - | - | - | - | - | - | - |
| 120. Bust of Sir John O'Shanassy | - | - | - | - | - | - | - | - |
| 121. Cupid and Psyche (loaned by Cr. J. Dynon, J.P.) | - | - | - | - | - | - | - | <i>Andreoni Rome.</i> |
| 122. Street Gamin of Paris | - | - | - | - | - | - | - | - |
| 123. Head of Old Colonist | - | - | - | - | - | - | - | - |
| 124. Temper | - | - | - | - | - | - | - | - |
| 125. The Flight from Pompeii | - | - | - | - | - | - | - | - |
| 126. Vase presented by French Republic to the Victorian Government | - | - | - | - | - | - | - | - |
| 127. Love and Innocence | - | - | - | - | - | - | - | - |

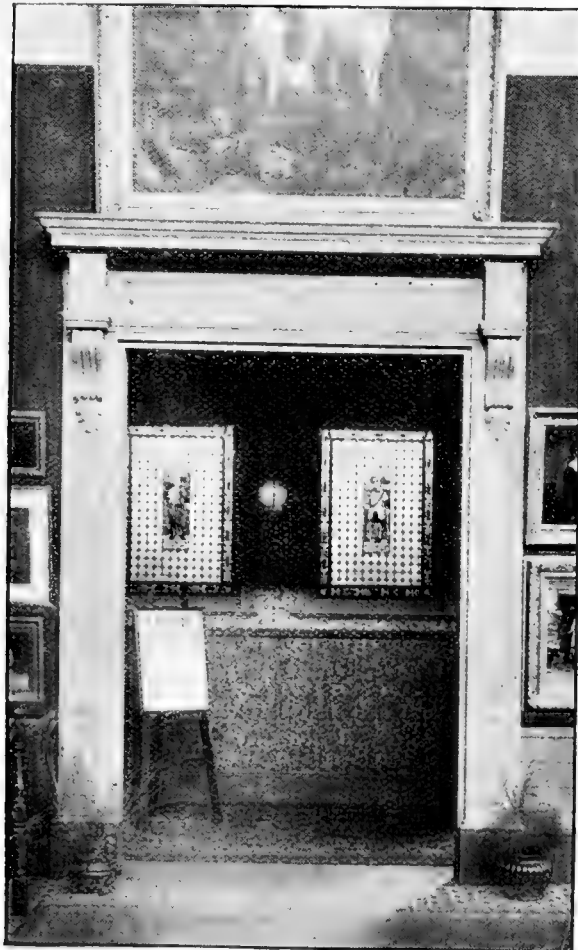


| | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---------------|
| 128. Charity | - | - | - | - | - | - | - | - |
| 129. Cain | - | - | - | - | - | - | - | <i>Duprè.</i> |

And the Lord said unto Cain, Where is Abel thy brother?
And he said, I know not : am I my brother's keeper ?—GEN. iv. 9.

130. Jewel Casket, formerly property of Marie Antoinette - -
 131. Breakfast Service, formerly the property of the Emperor Napoleon Bonaparte I.
 Chocolate Cup, formerly belonging to Beau Selwyn, the lover of horrible executions
 132. Specimens of Dresden China plates, hand-painted - - -
 133. Vases - - - - -
 134. Glass ball - - - - -
 135. The Ready Reckoner - - - - -
 136. Justice - - - - -
 This is a fac-simile of the group erected on the Law Courts at Bendigo.
 137. Victory - - - - -
 138. Stand of Indian Photographs illustrating the Opium and Indigo Industries.

Of the above, Nos. 1-31, 33 to 45, 48, 51, 52, 54, 55, 58, 59, 61-77, 79, 80 to 109, 114, 118, 130 to 132 are loaned by the Hon. L. L. Smith; Nos. 32, 47, 50, 57, 78, and 120, by Mr. A. Fletcher; No. 49, by Rev. J. Kennedy; No. 46, by Herr Pinschoff; Nos. 53 and 115, by Hon. T. Bent; No. 123, by Dr. Summers; and No. 121, by Councillor J. Dynon, J.P.



ENTRANCE TO THE REFRESHMENT-ROOM FROM PICTURE GALLERY.

From the Picture Salon open the Refreshment-rooms, where tea and coffee and other light refreshments are always obtainable at reasonable rates. On the walls of the Refreshment-room will be found a collection of photographs of American scenery, which were presented to the Trustees at the close of the Centennial Exhibition by Hon. Frank McCoppin, the Commissioner for the United States, and will repay inspection.

El Capitan, Yosemite.
 Mariposa big Trees.
 Liberty Cap and Nevada Fall.
 The Bridal Veil Waterfall, Yosemite.
 Hotel del Monte, Monterey.
 Glacier Point, Yosemite.
 Mount Shasta, altitude 14,442 feet.
 Cathedral Spires.
 Section of the Grizzly Giant, 33 feet in diameter.
 Castle Rocks.
 El Capitan, 3,600 feet.
 Sentinel Rock, 3,000 feet.
 The Half Dome from Glacier Point.

THE MUSEUM.

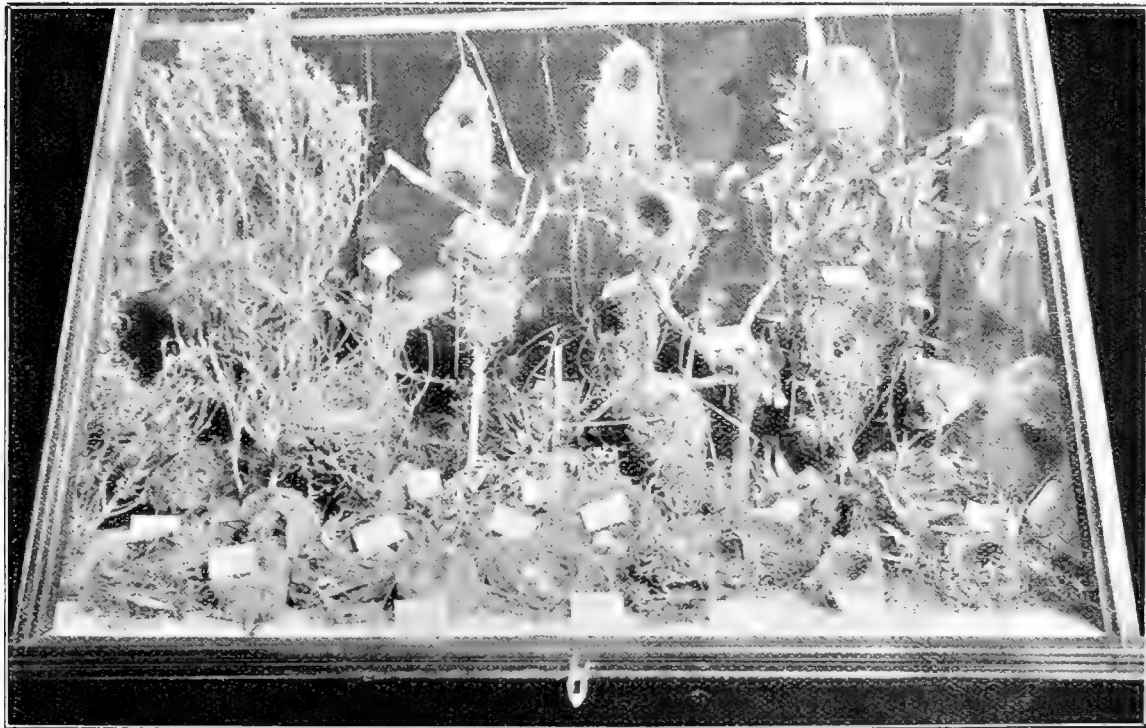
"A Museum is a consultative library of objects where people can see for themselves the things of which they read about in books."—THE RIGHT HON. T. H. HUXLEY.

The Museum opens from the Picture Gallery, and contains a large number of interesting exhibits, some of which are detailed below. Immediately on entering the visitor will find the

SOUTH KENSINGTON ART COLLECTION AND THE SOUTH KENSINGTON TECHNOLOGICAL COLLECTION, which comprise a large number of studies for the use of students of art, which were handed over to the Trustees by the late J. Bosisto, Esq., C.M.G., M.P., when the Technological Commission was disbanded. The studies are from the life and from the antique, and will be found very useful by students in all branches of art.

To the left the visitor will find the

ECONOMIC ENTOMOLOGICAL COURT.



COLLECTION OF NESTS OF VICTORIAN BIRDS.

the following description of the Exhibits in which has been prepared by Mr. C. French, F.L.S., Government Entomologist :—

"The advantages to be gained by a study of Economic Entomology are so many that to enumerate only a few of them would take up more space than we have at our command for the present catalogue or handbook.

"In a colony where agriculture plays so important a part in the every-day life of its inhabitants, and is by nature destined to hold a much higher position than it has hitherto done, it must be patent to all thinking people that any help we can give to those who live by the soil must be appreciated.

"In the first place, we must be able to show growers, by means of specimens, plates, &c., the differences between the insects which are destructive to crops and those which are beneficial, so that the first may be destroyed and the latter protected. The above remarks will also apply to the birds, the destruction of many of which has been, without a doubt, the cause of a large increase in the number of our insect pests.



"In this court, amongst the principal specimens of insects, both injurious and beneficial, may be mentioned the Codlin Moth, Pear Slug, Apple-root Borer, Woolly Aphis, Locust, Fireblight of the Wattle, Peach Aphis, Green Beetle, and numerous others of the destructive class. Amongst the beneficial ones are many insects which are parasitic on the destructive kinds, as scale, carval of moths, &c., &c., including the wonderful little lady-bird, *Vedalia cardinalis*, which tiny insect has been so successfully introduced into the orange groves of America, Africa, &c., for the purpose of combating the attacks of the *Icerya Purchasi* or cottony-cushion-scale. A few years since the whole or a greater part of the orange groves of the above-named countries were threatened with extermination, but the *Vedalia* with its wonderfully voracious nature has arrested the progress of the plague, and the cottony-cushion-scale has in many parts been altogether eaten up and destroyed by the *Vedalia*.

"The Wood Borer, of which three illustrations are here given, are amongst the most destructive of our noxious insects, and preventive and remedial measures for which are given in the illustrated handbooks, Parts I. and II., just issued by the Victorian Department of Agriculture. Three of them, viz., *Urucanthus triangularis*, *Piesarthrius marginellus*, and *Diadoxus pistacina*, being amongst the most destructive.

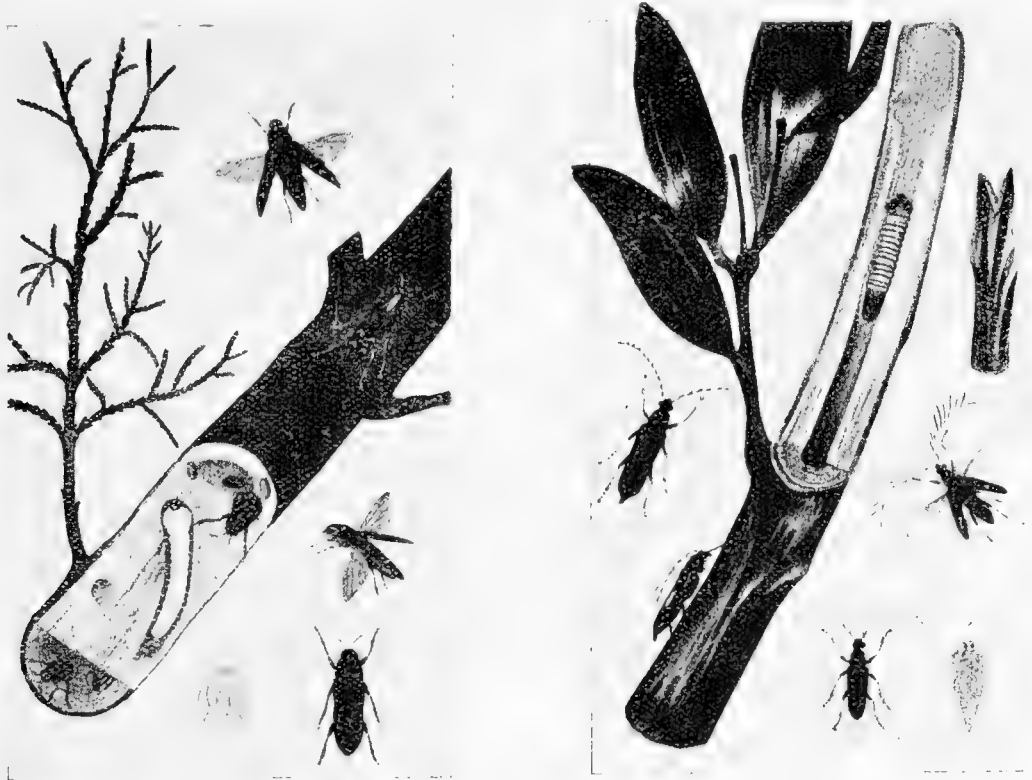
"The cases in an horizontal position show the various insects at work on timbers of different kinds.

"One of the most instructive exhibits in this court is a case containing the external dissections of the parts of various insects. They have been prepared for the use of schools, and have already been largely availed of by pupils and others interested.

"The charts which line the court represent the life-history forms of many of our most destructive insects, also illustrations of some of which are parasitic on same. An enterprising American fruit-grower has said—'Our watchword must ever be : Onward and upward, and falter not ; although difficulties apparently insurmountable arise, he who will may overcome them. The time was when our glorious climate, fruitful soil, and exemption from all diseases and pests, made our golden State the wonder of all who were conversant with its fruits and flowers.. Now, alas, the spoiler's hand is felt ; a change has come over the spirit of our dream. It seems as though all that is detrimental to the fruit interest is here or coming, making eternal vigilance the price of success in this, the chief industry of the State. The time has come when every one who by this occupation would thrive will find ceaseless use for both head and hand ; even then the fittest only can survive.'

"When a person takes up land for the purpose of making a living, whether it is for growing anything from wool to special products, he will find that there are leisure moments which may be profitably spent in the interesting and eminently useful study of Economic Entomology. An acquaintance with the life-history and 'manners and customs' of insects, either noxious or beneficial, is to help us in suppressing certain pests, and to preserve from destruction such as are of use, and which consequently should be protected. The trained man, for example,

knows the insects are on the roots of his trees, where they hibernate as well as on the branches, and he at once concludes that he should first strike at the 'root' of the trouble : whereas the man who knows nothing of the subject, and probably cares little either, proceeds to lament, and not infrequently winds up by quite unnecessarily chopping out his trees. Of late years great



attention has been given to spraying the trees with various insecticides, and nowadays a good spraying gear is a part and parcel of every well-regulated orchard, farm, or vineyard. It has been estimated that for Codlin Moth alone no less than 70 per cent. of fruit has been saved by timely application of the arsenites, as Paris green, which should be used in a proportion of 1 lb. to from 150 to 200 gallons of water. For full instructions, see Parts I. and II. of *Handbook of the Destructive Insects of Victoria*, issued by the Victorian Department of Agriculture."

The following exhibits are well worthy of inspection :—

- Case No. 1. Australian wood borers, &c., species—Buprestis beetles and other families.
 2. Australian wood borers—Longicorn and Buprestis beetles.
 3. Australian borers and leaf feeding beetles—Various families.
 4. Australian wood boring beetles—Longicorns.
 5. Habitations of various kinds of economic insects.
 6. Dissections of external parts of insects with key to the same, prepared for the use of schools under the direction of C. French, F.L.S., Government Entomologist of Victoria.
 7. Specimens of various insect pests, as—Scale insects, apple and rose blight, &c., collected near Melbourne; many of the specimens doubtless introduced from Europe.
 8. Australian Lepidoptera Moths and Butterflies, the larvæ of which are destructive to vines.

- Case No. 9. Australian Phasmidæ or Stick insects feed on foliage.
 10. Australian Locusts, Grasshoppers, and other insects destructive to crops.
 11. Australian Ichneumon Flies, &c., which are parasitic on many noxious insects. These should be protected by growers.
 12. Japanese Lepidoptera.
 13. Japanese Lepidoptera.
 14. Timber showing ravages of insects.

PLATES ILLUSTRATED.

Hessian Fly, Onion Fly, Gout Fly, Crane Fly, Bot Fly, Beet Fly, Hop Aphis or Green Fly, Wood Leopard Moth, the Pine Saw Fly, the Winter Moth, Ox Warble Fly, Magpie Moth, American Blight, Codlin Moth, Spruce Gall Aphis, the Goat Moth, the Corn Saw Fly, Pine Weevil, Gooseberry and Currant Sawfly, Apple Blossom Weevil, Large White Cabbage Butterfly, the Stem Eel Worm, Plant Bugs, the Potato Disease, the Pine Beetle, the Turnip Fly, Surface Caterpillars, Bean and Pea Beetles, the Corn Thrips, Wire Worm and Click Beetle, Cockchafer.

Destructive Insects of Victoria, with notes on the methods to be adopted to check and extirpate them. Prepared by C. French, F.L.S., F.R.H.S., Government Entomologist. Chapters 6 to 14, in 13 frames.

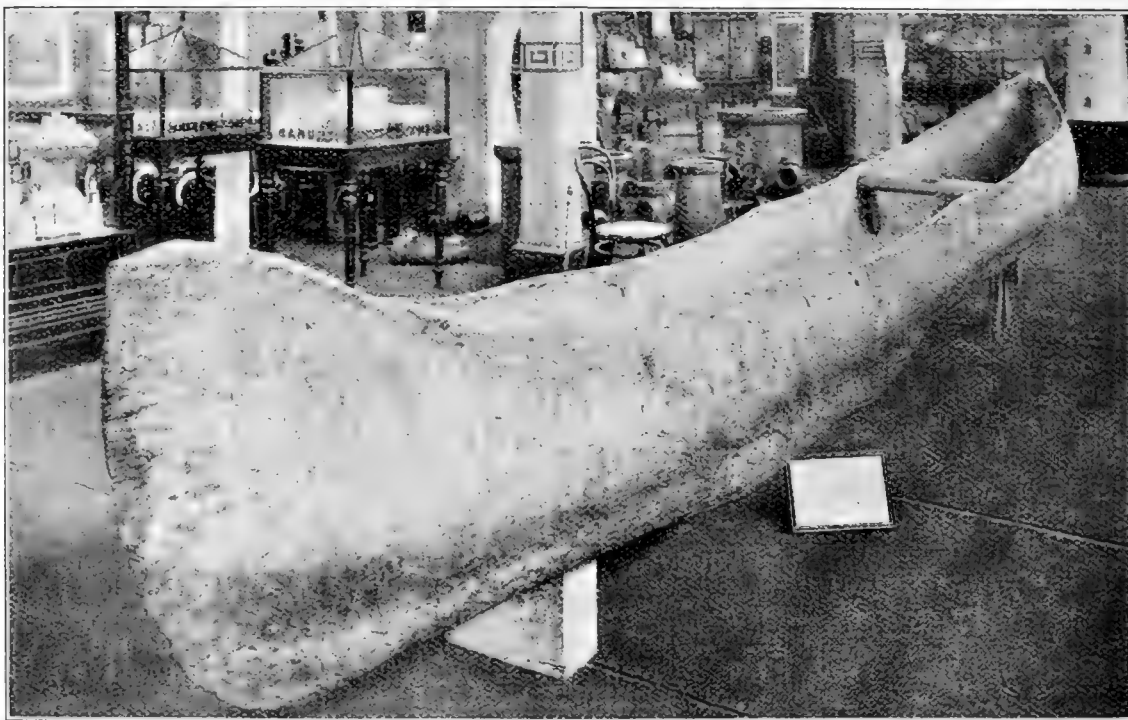
Phylloxera of the Vine, 2 plates.

Illustrations of the Silk industry.

Mulberry Tree in case.

Cases of Silk (2).

Photograph filature and reeling room of California.



CANOE FROM NORTHERN TERRITORY.

Continuing to the left one comes to the

ZOOLOGY COURT,

containing the following specimens :—

Native and Tiger Cats.
 Birds of New Guinea.
 Parrots and Cockatoos.
 Goura Crowned Pigeons.
 Bower Birds.
 Impeyan Pheasant, India.
 Sparrow Hawks.
 Lyre Birds.
 Native Companions.
 Birds of New Guinea.
 Victorian Game Birds.
 Emus—Male, female, and small one.
 Wallaby, Native Bears, Old Man Kangaroo, Kangaroo, Snake, Python, Platypi,
 Laughing-jackass.
 Skin of Tiger shot in India by the Royal Princes, lent by Hon. L. L. Smith.

Next in order is the

ECONOMIC BOTANY COURT.

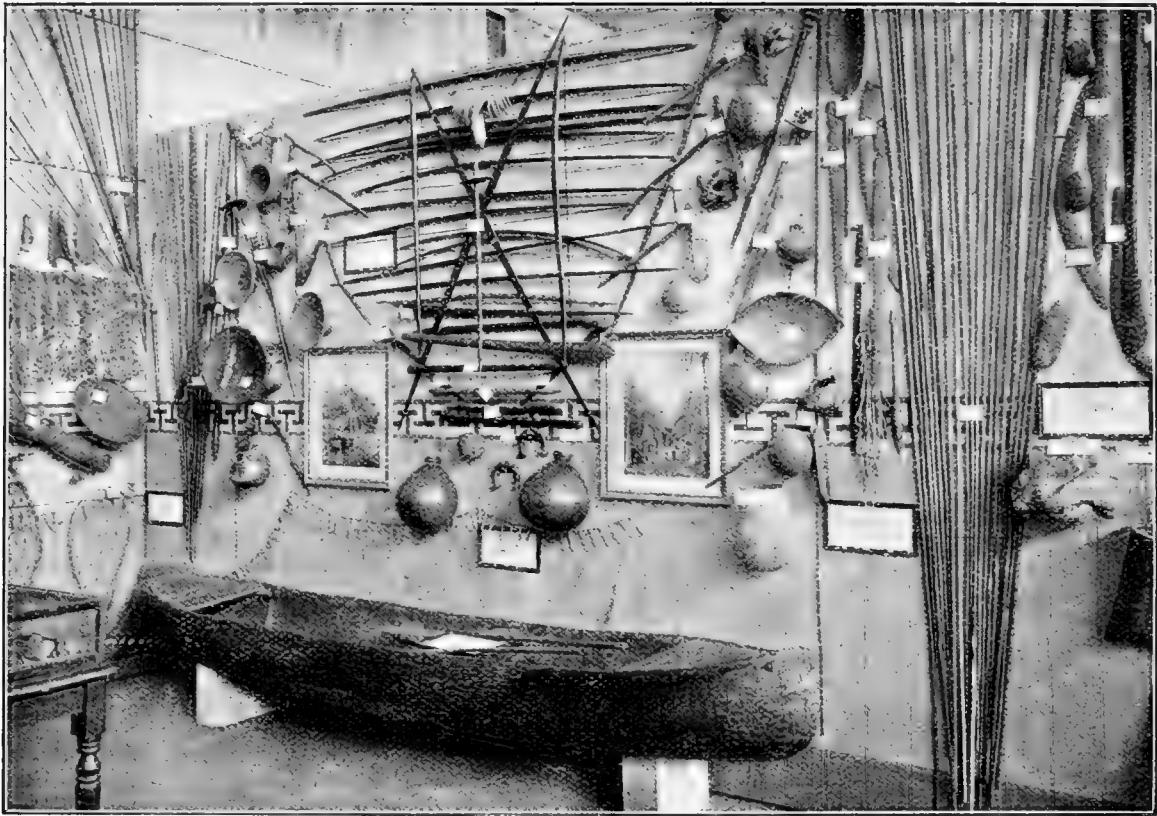
The Exhibits in this Court exemplify in an infinitesimal degree the enormous resources this Continent possesses in the way of natural botanic products.

Our timber wealth alone is to be calculated by the worth of millions and millions of pounds, and the visitor can see here exemplified the economic uses to which the most despised of our ordinary trees can be put. The timber which is being ruthlessly destroyed all over this fair land of ours is the result of the natural growth of ages, and it is difficult to say what organic changes may not be wrought in our climatic conditions by this ruthless destruction of nature's sheltering mantle to the earth.

The Exhibits may be enumerated as below:—

9 cases, Models of Fruits.
 2 cases, Specimens of Australian Woods.
 9 cases, Economic Pharmaceutical Collection.
 2 cases, Models of Fungi.
 2 cases, articles of every-day use manufactured from Australian Timber.
 Queensland Timber, as applied to building purposes.
 440 Specimens of Indian Timber.
 Annotto Dyes.
 Specimens of Tea.
 Long Pepper.
 Beans.
 37 Specimens of South Australian Timber.
 Queensland Timber Trophy.
 2 Photographs, School of Agriculture, New Zealand.
 40 Plates, illustrating diseases of plants.
 111 Varieties of Ferns (pressed).
 12 Plates of Fungi.
 Block of Gum from grass tree (*Xanthorea Australia*).
 65 Specimens of Italian Woods.

ETHNOLOGY COURT.



COLLECTION OF ABORIGINAL WEAPONS.

Tappa Cloth, Ramie, Canoe Paddles—Polynesia.

Idols—New Guinea and Polynesia.

Pillow, Model of Canoe—South Sea Islands.

Australia—

Woomeras, Spears, Clubs, Boomerangs, Trinket Baskets, Necklace, Spade, Fishing Basket, Spears, &c.

Idol—New Guinea.

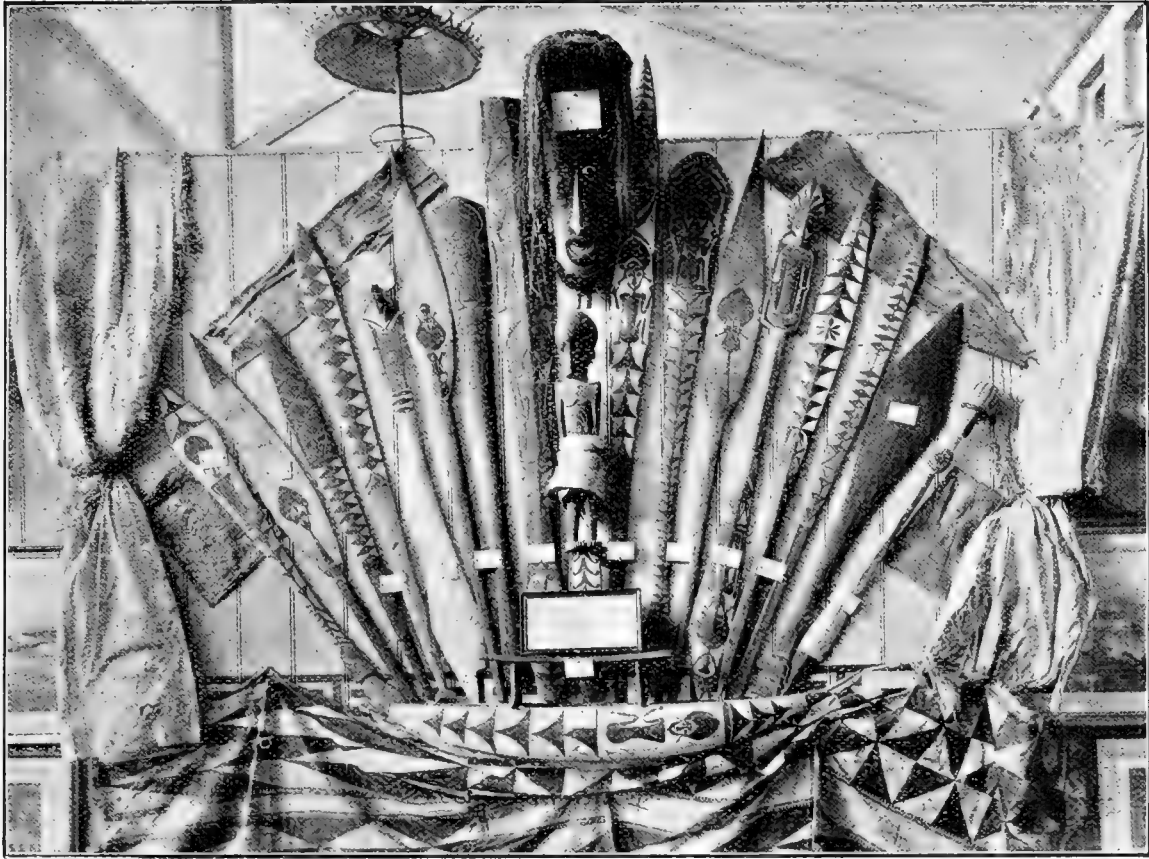
Photos. Avenue Royal Palms—Bathers.

Bones of Natives—North Australia.

Baskets, House Mat, Food Bowls, Pandian Pipes, Craniums, Armlets, Fish Hook, Basket Holder, Lime Box, Sunshade, Tongs, Adze, Fish Pot, Mat for men to wear, Fishing Net, Fan, Paddles, Native Cloth, Native Dress, Fish Idol.

Wigs, Fan, Lime Vessel, Tongs, Fish Hooks, Pendants, Cocoanut and Shell Spoons, &c.

Baskets, Dress, Canoe God, Dilly Bags, Water Vessel, Fishing Net, Battle Axe, &c.



THE ETHNOLOGICAL COURT.

EGYPTIAN CURIOS.

Mummy Cloth, Idols, &c.

Mummy Cloth, Idols, &c.

Baskets, Fruit Trays, Spears, Crocodile Harpoons, Antelopes' Horns, Native Dress, Drum, Brass Tumblers, Harp, Dhobb Sahara, Guitar, Arrows, Double Drum, Meat Preserving Basket, Snout of Saw Fish, Idols, Fly Whisp.

Opening from this Court is

THE EGYPTIAN TOMB.

constructed to represent an Egyptian Tomb, and has been erected by Mr. John Hennings. The ceiling is taken from Owen Jones' work, *The Grammar of Ornament*. The wall on the north side depicts a funeral boat passing a river or lake on its way to the entombment of the body contained in the vessel. This sketch is taken from George Ebers' work, *The Burial Place of Forty Kings*. The west wall gives a representation of a double figure of Anubis, a wolf or dog-headed god, watching before a sepulchre which is securely locked and bolted. This is taken from a German work by H. Kobb. On either side of the central group are portraits of daughters of the King attending the rites in honour of the dead. They wear the lotus-shaped wand and elaborate head-dress according to their social station on earth. The southern wall

shows a picture of a sarcophagus containing a mummy being conveyed to its resting place, while various fruit and vegetables are taken with it on its last journey. This, as well as the ornament on the east wall, is taken from Sir J. Gardner Wilkinson's work, last published in 1854. The



THE EGYPTIAN TOMB.

latter picture represents a king and his attendants in a war chariot leaving or entering a city. The porticos are ornamented with the well-known Scarabæus with wings extended, and which is worshipped as a holy beetle for its healthful habit of destroying unwholesome offal.

The mummies which are shown in the glass case in the centre of the tomb were purchased and sent from Egypt to J. S. Gotch, Esq., a resident in Melbourne, and presented by him to the Trustees, with the desire that they would be of interest and afford instruction to the public generally.

They were amongst an extensive find of mummies lately exhumed in the tombs discovered in the Faiyoum district, near Lake Mœris, 40 miles south-west of Cairo, and belong to the middle period of ancient history in Egypt, some 2,000 years before the advent of our Saviour Jesus Christ.

One, in a state of decomposition, is the mummy of a man who was probably a governor or ruler of one of the seven nomes or districts into which Middle Egypt was at an early period divided. The outer sarcophagus contained two others beautifully coloured and decorated, as can be seen in the glass case at the side. The inscriptions found upon it, according to the opinions of learned savants, and the researches of Dr. S. Birch, of London, and others, and the mode of embalming, point to the period between the Dynasties XII. and XVII., or that of Abraham's descent to Egypt.

The fact of this mummy having its knees drawn up as in a sitting posture also points to its early date. When first opened in its case, much of it fell to dust ; and at the bottom of the case,

or inner sarcophagus, were found blue, yellow, and brown beads, and bugles of enamelled clay, which had formed the necklace ornament or covering of the breast, and which was the insignia of high rank. Various seeds and dried beetles were also found amongst the dust, composed of the



ENTRANCE TO EGYPTIAN TOMB.

decayed body and linen, mingled with pieces of the bitumen which had been used in the process of embalming. These are now visible in the glass case close by. The upper part of the body has not yet been uncovered, fearing it may also fall to dust.

In hieroglyphic characters round the outside sarcophagus, which contains the funeral epitaph and the prayer for the departed spirit, can be deciphered his name, viz., "Amion, son or servant of Ptah" (meaning both priest and esteemed of Ptah, that form of deity worshipped in both Middle and Lower Egypt), "a good man made like to Osiris, whose life justifies his expectation of eternal bliss."

The female mummy unwrapped is that of a priestess of the Apis or bull, which was worshipped principally at Thebes, and is of a much more recent date, probably about the time of Pharaoh Necho, who lived in the Dynasty XXVI., about 700 years B.C., near the days of King Josiah in Palestine, and a century before Cambyes, the Persian, conquered Egypt.

Down the centre of her coffin lid is the inscription:—"A Royal gift to Osiris, of Pet Amenti, the great God and Lord of Upper Egypt (Thebes), consisting of the best of drinks, many oxen, haunches of gazelle, that the great God of the land of the Nile may be propitious to the Osirified, and declared to be justified, LE SEB" (*i.e.*, her name).

She was a young lady probably about seventeen years of age, whose purity of life entitled her to a welcome in the abode of the blessed. This mummy is in a perfect state of preservation, and is remarkable for the absence of bitumen, so freely used in the chief embalmings of Egypt, and also for the quantity of fair hair adhering to the skull at the time of unrolling, which took place on the 26th January, 1893, in the presence of a large gathering of distinguished citizens of Melbourne. Some hundreds of feet of linen wrappings were taken off the body by Dr. Neild, assisted by several medical gentlemen, after the third lecture on Egyptology had been publicly delivered by the Rev. David Meadowercroft.

COLLECTION OF THE DEPARTMENT OF MINES OF VICTORIA,

which comprises (*a*) collection of rock specimens illustrating all the characteristic geological formations of Victoria; (*b*) collection of the principal minerals occurring in Victoria; (*c*) collection of metalliferous rocks and ores and of samples of coal illustrating the mineral products of



TROPHY OF BUILDING STONES

economic value occurring in Victoria; (*d*) collection of specimens of building and ornamental stones; (*e*) models of principal nuggets of gold found in Victoria; (*f*) specimens of minerals and rocks occurring in countries outside Victoria; (*g*) geological maps and mining maps, plans, and photographs, illustrative of the geology and mining features of Victoria; (*h*) model of the Long Tunnel mine at Walhalla.

MINING IN VICTORIA.

By James Stirling, Government Geologist.

Although territorially Victoria is the smallest state in Australasia, covering an area of 87,889 square miles, yet its variety of physical features, climatic conditions, soils, &c., and more especially the proved stability of its splendid auriferous resources, render it at once the premier colony of the continent. When it is stated that since the early gold discoveries in 1851-2 no less a sum than £246,400,000 has been won—the bulk of this from a relatively small portion of the proved auriferous area—and that the gold-mining industry is only approaching a condition of permanency, through a better knowledge of auriferous matrices, economic methods of mining and treating the ore, it will not be difficult to realize how important a factor the mineral wealth, both actual and potential, has been, and will continue to be, in stimulating all other forms of production. Not only in the highest altitudes, over 6,000 feet above sea-level; in the deep recesses of the valleys, only a few feet above sea-level; but at depths of over 3,000 feet from the surface—or 2,000 feet below sea-level—are mining operations being profitably carried on. New discoveries in the depth of the dense forest-clad mountainous areas, as tracks are being cut into their secluded recesses, are constantly being made. Deep leads, concealed beneath extensive basaltic flows, are being traced over hundreds of miles of territory by boring operations. And as the areas over which the metallic substances are extended, and the methods of productions cheapened, together with a constantly increasing feeling of greater stability in the mineral resources as fields for investment, so will the progress and prosperity of the colony proceed *pari passu* with the development of its gold-mining industry.

GOLD-BEARING FORMATIONS.

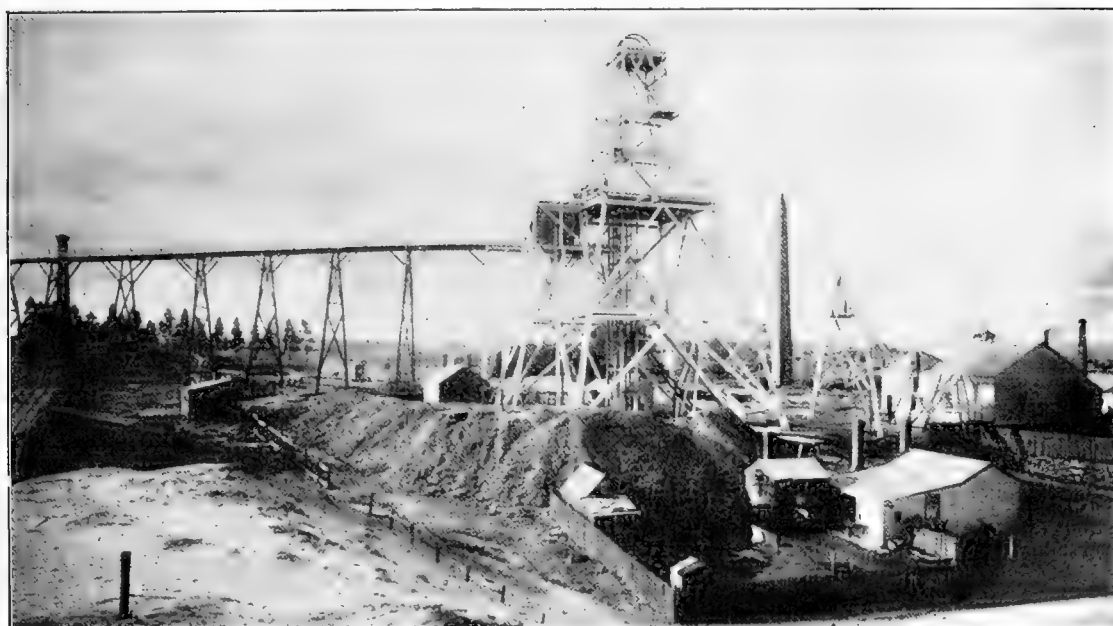
The principal gold-bearing formations, covering one-half of the entire area, consist of Silurian slates and sandstones, which have been intruded upon by plutonic rocks, such as granite, porphyry, diorite, &c., and which are overlain in the western portion of the colony by extensive lava flows—the basalts of Tertiary age. Roughly speaking,

there are 29,000 square miles of exposed Silurian rocks, which are almost everywhere intersected by auriferous quartz veins or covered in the valley by auriferous drifts, while there cannot be less than 15,000 miles of Silurian sedimentary rocks concealed beneath the Tertiary lava flows or Tertiary sedimentary rocks. In short, the older gold-bearing Palaeozoic rocks extend from the western portion of the colony, in the Glenelg Valley, to the boundary of the colony on the east, a distance of over 500 miles. In the eastern part of the colony the Silurian formations are in places overlain by massive Devonian rocks, and in the southern by Jurassic rocks; while in the west are remains of an extensive formation—the Grampians—whose age is still uncertain. With the exception of one locality in the Devonian area of limited extent, these formations are not known to be auriferous. The relative areas covered by the different rock masses at the surface may be estimated as under:—

Sedimentary formations: Palaeozoic Devonian, lower, middle, and upper, 8,500 square miles; carboniferous, 100 square miles; Cambrian, 100 square miles; Silurian, upper and lower, 28,300 square miles.
 Mesozoic: Triassic, 200 square miles; Jurassic, 3,684 square miles.
 Tertiary: Eocene or oligocene, miocene, pliocene, pleistocene, recent, 30,000 square miles.
 Plutonic and Igneous rocks: Basalt, 11,000 square miles; granite, 4,000 square miles; porphyries, diorites, 2,000 square miles.

BENDIGO GOLD-FIELD.

The principal reefs in this field occur in the fissures produced by the arches formed by a buckling of the strata into a series of folds; or, in other words, the prominent feature of the field consists of numerous more or less parallel axial lines, having a strike of N. 16 deg. W., along the course of which the great mass of slate and sandstone rocks are bent over into a series of anticlinals, with corresponding synclinals or troughs between. The dip of the beds to the east and west is about 60 feet. These axial lines or centre country do not continue horizontal for any distance, but have an end-long dip or pitch. The reefs are called saddles, and thicken and diminish in size as they are traced along



GOLD MINE BENDIGO.

the axial lines. The eastern and western extensions are called legs. The saddles are often from 20 to 50 feet across, while the legs are from 1 to 4 feet, but frequently become attenuated in depth. A succession of such saddles occurs at different levels, not generally immediately below the other, but listed to one side, principally to the west. In a limited area of about 7 miles in length by 3 miles in width there are no fewer than twelve distinct lines of saddle reefs, known as centre country. Mining operations have extended to a depth of over 3,000 feet with profitable results. No less a quantity than £18,009,150 worth of gold has been won from this limited area, and from the Bendigo district up to date £53,063,356. The deepest shafts on the field include:—

| | | | Feet. |
|-----------------------|-----|-----|-------|
| Lansell's 180 Mine | ... | ... | 3,350 |
| New Chum Consolidated | ... | ... | 3,267 |
| Lazarus Co. | ... | ... | 3,210 |
| New Chum Railway | ... | ... | 3,037 |
| New Chum and Victoria | ... | ... | 3,100 |
| Shamrock | ... | ... | 3,000 |

The enormous wealth realized from a few of the Bendigo saddle reefs may be estimated from the following figures:—

| | | |
|--|--------|------------|
| The Carlisle Company (now amalgamated with North Garden Gully, Carlisle, and Pass By) has produced over 350,000 oz., value | | £1,400,000 |
| Garden Gully United, 346,000 oz., value | | 1,384,000 |
| Johnson's Reef, 281,000 oz., value | | 1,124,000 |
| Great Extended Hustler's, 235,000 oz., value | | 940,000 |
| Catherine Reef (on New Chum line, Eaglehawk), 162,000 oz., value | | 648,000 |

Although the reefs in the central area of Bendigo occur in the form of saddles, yet to the north-west, as at Marong; north, at Sebastian, Raywood, &c.; or south, at Maudurang, they assume different forms. At Marong, where gold occurs in the slates near the surface, slightly inclined or even vertical veins occur in places forming irregular seams of quartz in a band of sandstone. At Mandurang, towards the Crusoe reservoir, flat veins occur; and where such veins



MINERS' HUT.

intersect a particular band of strata which contains a thin, almost parallel band or seam, of slightly different mineral composition to the enclosing strata, the richest gold is found. I have no hesitation in affirming that there is work for centuries to come, not only in exploiting the saddle formations down to as great a depth as 4,000 feet, but in tracing the auriferous belt to the north and south, or developing such parallel belts as Ellesmere to Axedale on the east, or Marong to Lockwood on the west. It is estimated that, making due allowance for the increased cost of haulage and deep sinking, quartz containing 5 dwts. of gold to the ton can be made to pay in the deep levels at Bendigo.

BALLARAT.

At Ballarat there are at least four well-defined lines of reef, such as the Guiding Star, Star of the East or Consols, the Indicator on the Llanberris and Speedwell line, and the Fire Brigade line. It is believed that the Indicator belt of country on the eastern side of the field will be found to extend past Creswick and Allendale towards the Moolort Plains. Some idea of the enormous value of the gold mines within a limited area in the Ballarat district may be gleaned when it is stated that the yield of gold up to the present has been £71,886,080. One mine alone, the Star of the East, carried to a depth of 2,000 feet, has yielded over £520,000 worth of gold, declaring dividends of about £221,000; while the Band and Albion, with which is now incorporated several smaller mines, has produced £2,078,325, and declared £900,000 in dividends. The Silurian slates and sandstones of the Ballarat field differ slightly in composition from those at Bendigo, and are intruded upon by granitic and felsitic dykes in places. Here several alluvial lead systems trend southerly, westerly, and north-westerly, noted for their richness and for the occasional discovery of large nuggets in such tributary leads as Little Bendigo, Canadian, and Hiscock's—such nuggets as the Welcome, found at Bakery Hill, which realized £9,325; the Lady Hotham, at Canadian Gully, £3,000; the Nil Desperandum, £1,950; and another at Canadian Gully of £5,532. During 1855-6 such leads as Inkerman, Red Streak, Frenchman, Esmonds, Malakoff, Milkmaids, and Redan were opened out and proved very rich. It is estimated that as much as 1.637 oz. of gold was obtained from one day's washing at the Band of Hope. My colleague, Mr. Lidgely, who has made a detailed survey of the field, estimates that from twenty mines £5,902,050 has been won; that dividends to the extent of £2,500,000 have been paid; the total amount of calls only reaching £594,914. The tracing out of the Ballarat lead systems to the west, north-west, and south-west still offers a field for mining development.

AURIFEROUS CONTACT ZONES.

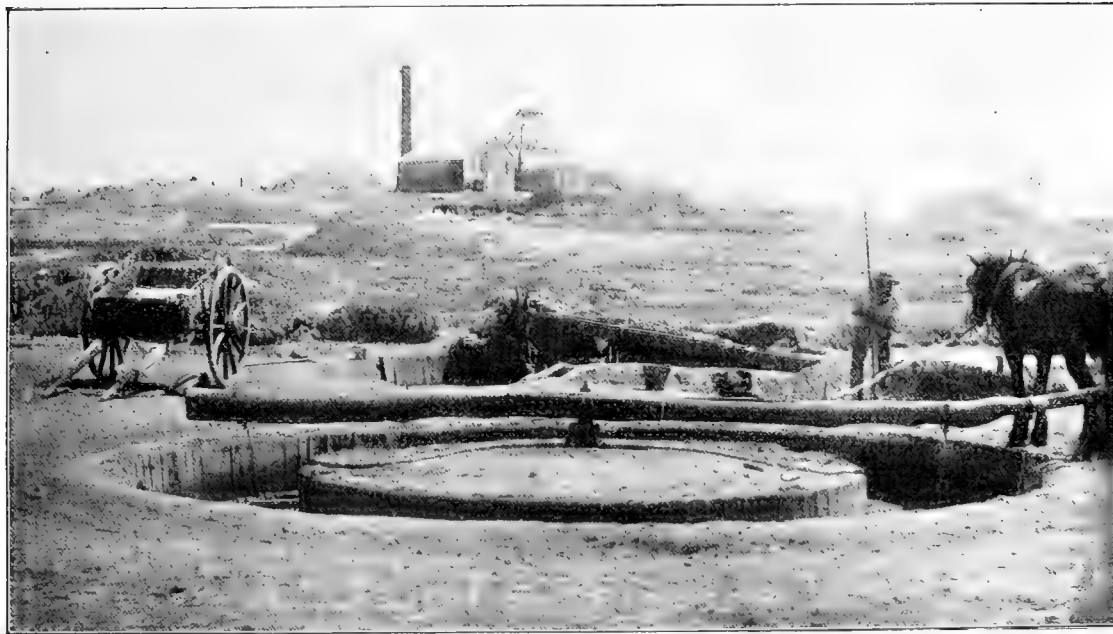
The influence exerted on the Silurian strata by the enormous masses of eruptive rocks, such as granites, porphyrites, diorites, felsites, &c., and which now appear as bosses and apophyses, known as dykes, &c.; and the structural and chemical changes of the mineral components along the planes of the contacts has for some time been the subject of critical research; but it was not until the relation between the occurrence of auriferous quartz veins formed at or near the contacts, both in the eruptive rocks, and to a greater extent in the sediments they invaded, that the attention of practical miners was drawn to the value of following out the contacts in the field as a guide to prospecting operations. In the north-eastern district, in an area hardly yet touched by systematic prospecting, it is estimated that there are fully 300 miles of contact rocks intersected by auriferous quartz veins.

MALDON.

The Maldon gold-field is principally to the east of the granitic rocks at Mount Tarrenhower. The alteration of the sediments has produced rocks of the hornfels type. A well-defined elvan dyke traverses the field, and in the case of the Derby mine is flanked on either side by auriferous veins. Fully 47 reefs have been described on this field, which strike N. 12 to N. 30 W. Several of the mines are now approaching a depth of 2,000 feet. Such examples of permanency as the South German, &c., may be referred to as illustrating the stability of mining on the field, which, within a small area, has already produced £2,306,620 worth of gold.

STAWELL.

At Stawell the auriferous quartz veins intersect a belt of country margining the granite of the Black Range. The rocks are very much indurated or altered by contact metamorphism, and the sediments are penetrated by numerous dykes of porphyrite and diorite. The auriferous quartz veins strike from south-east to north-west, and generally underlie to westward at an angle of 45 degrees. In almost every instance, except the Magdala-cum-Moonlight, a flat reef has been found abutting against the vertical on the eastern side, with a northerly underlay, and



PUDDLING MACHINE.

the richest quartz has for the most part been found at no great distance eastward from the line of junction. The principal mines include the Magdala, Oriental, Slane and Scotchman, Perthshire, Hampshire, New Chum, Cross, &c. From this group of mines no less a sum than £4,018,884 worth of gold has been won. A considerable amount of boring has been carried on over this field, and auriferous quartz veins proved in advance of the actual workings. There is no reason why the reefs should not extend still further to the north-north-west of present workings. At present the Magdala, Oriental, and North Magdala are working at a depth of 2,409, 1,832, and 1,640 feet respectively.

DIORITE DYKES.

In this case the principal bed rock is of Upper Silurian age, and the dykes intersect the strata both with and across the line of strike. The quartz veins traverse the dyke in various ways, either vertically from wall to wall across the dyke parallel to it; either along the wall or in the body of the stone, and horizontally or nearly so from wall to wall. In places where the dyke stone is absent, the space between the walls is filled with broken-up rubbly shale or slate with thin quartz leaders. Typical examples of such dykes are seen at Wood's Point, Walhalla, Foster, Tanjil, Rasperry Creek, Costerfield, &c.

WALLHALLA.

At the celebrated Long Tunnel mine, Wallhalla, the dyke trends parallel with the strike of the strata west of north. It is impregnated more or less with iron and arsenical pyrites. Two quartz lodes meeting in an apex or cap accompany the dyke along or near to its walls on either side, while others intersect the body of the dyke. The shoots of auriferous quartz dip northerly, the underlie being westerly. This mine is a splendid instance of the permanency



A WHIM.

of the auriferous veins associated with the dykes; it has yielded over 631,344 oz., or in value £2,525,376, and has been carried to a depth of nearly 2,000 feet. The whole of the belt of country extending northerly from Wallhalla through the heads of the Jordan and over the Dividing Range at Matlock to Wood's Point, and still further northerly to Jamieson, is auriferous and of similar character, although on the Dividing Range, near Matlock, there is probably a junction of the Upper and Lower Silurian beds, from the occurrence of fossil graptolites found there by my colleague, Mr. Ferguson, 300 feet or more below the saddles.

WOOD'S POINT.

The Morning Star dyke, which trends on the surface 54 deg. west of north, is intersected by quartz veins, which are nearly horizontally disposed, inclining but slightly to north-west. They penetrate the adjacent slates, and are richest near the contact. Several bores were put down, which proved floors of quartz at lower levels, and show that the quartz veins occur to great depths in the dyke masses.

FOSTER.

Auriferous quartz veins penetrate into the adjacent rocks beyond the porphyritic dyke which intersects the Silurian rocks at this place. Other localities where the dykes have associated with them auriferous quartz veins are numerous in the country occupied by the Upper Silurian beds, as at Alexandra, heads of Big River, Tanjil, Cassilis, Owens Valley, Queenstown, &c., &c.

MERIDIONAL BELTS OF REEFS.

A feature which is common both to the Lower and Upper Silurian beds, no matter what the amount of local variation in the direction or formation of the quartz veins may be, is the meridional belts which come into view when the position of the quartz veins are plotted on the map, *i.e.*, there is a general meridional trend of the gold-bearing portions of strata. This significant fact was drawn attention to by Captain Panton, P.M., and C. W. Ligar, ex-Surveyor-General, during 1858—by the former in the *Mining Journal*, and by the latter in the *Transactions of the Mining Institute*. My predecessor, Mr. R. A. F. Murray, was able to direct special attention to their importance by defining a number of auriferous belts or zones. Later discoveries go to confirm the prediction of Messrs. Panton and Ligar in a remarkable degree, so that now fully thirty of such auriferous belts may be mentioned.

PERMANENCY OF QUARTZ MINING.

Enough has been stated to demonstrate beyond the possibility of doubt the enormous extent of the gold-bearing belts of strata, and that there is practically an inexhaustible supply of gold yet to be won; in not only following the downward prolongations of the reefs already discovered, but in renewed search for further surface outcrops along the extension of the belts I have indicated. No theoretical speculations respecting the genesis of gold-bearing veins need militate against successful mining enterprise in those districts where the downward prolongations of the auriferous reef formation is at present a matter of conjecture. The fact remains that from the highest surface altitudes to a depth of 3,000 feet below sea-level gold-bearing strata undoubtedly exists. The permanency of Victoria's gold-mining industry is an established fact so far as the quartz-bearing formations are concerned.

ALLUVIAL DEPOSITS AND LEADS.

There is hardly a single river in Victoria which does not contain alluvial auriferous deposits along some portion of its course. These detrital deposits have been classed as "surfacing," comprising earth or thin layers of clay, rubble, and decomposed rock on the slopes or summits of hills composed of Silurian rock. The gold is found free, or associated with fragmentary quartz, from the surface earth down to chinks and crevices of the bed-rock.

River, Creek, and Gully Workings.—Deposits of gravel, drift, &c., resting on the Silurian bed-rock, or on the banks of water-courses; in some cases terraces are met with on the rocky slopes high up above the present river beds.



SINKING SHAFT.

Leads.—Gravels, conglomerates, &c., deposited in the beds of ancient rivers, in some cases only covered by recent accumulations, and in others by several layers of basalt. The beds of these ancient rivers are in some localities above, and in others below, those of the existing streams, as the Dargo High Plains and Clunes or Ballarat districts respectively, and are worked by tunnels or shafts accordingly.

In addition to the above there are widespread deposits of gravels, conglomerates, &c., believed to be due to estuarine or marine action; the gold is more patchy in its occurrence, though sometimes found in defined runs; not necessarily in the deepest hollows of the bed-rock, but often on the ridge or slopes thereof. Some of these deposits cap hills of Silurian rock; others constitute reef washes beneath the basalt, but at higher levels than the deep lead gutters.

LOCALITIES OF LEAD SYSTEMS.

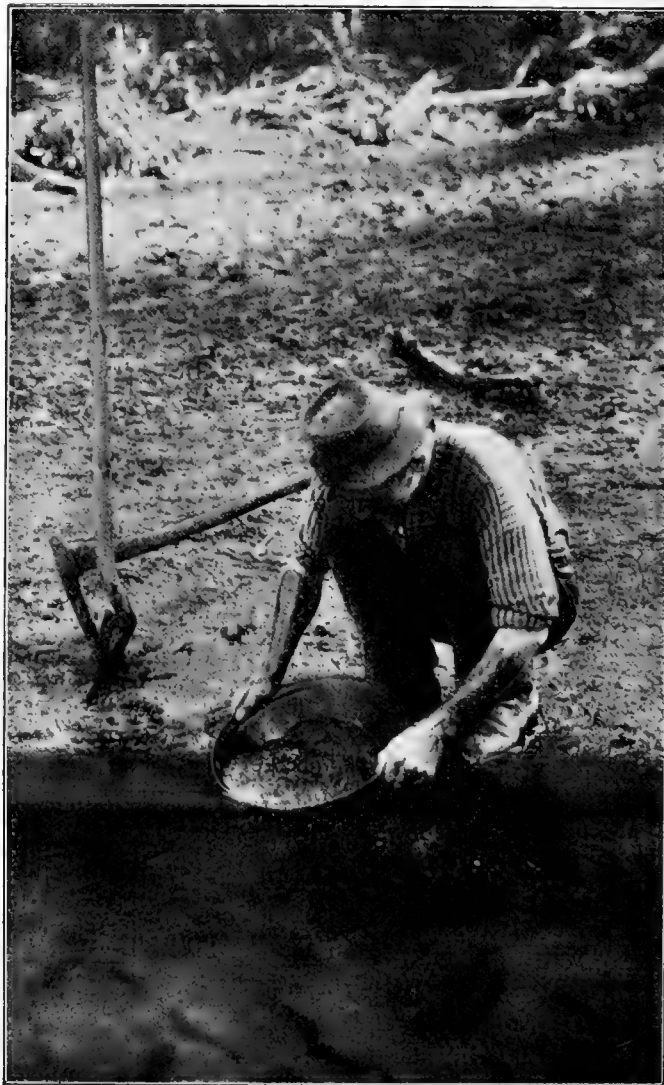
Commencing at the western end of the colony, the first is that along Mather's Creek, south of Balmoral, although there is a limited extent of slightly auriferous gravel south-west of Harrow, on the Glenelg. The Stawell leads comprise the deep lead and its tributaries, situated from 3 to 5 miles north-west of the town; and the Commercial-street lead and its tributaries, commencing at the reef and terminating at Seventy Foot Hill, about 3 miles west of the town. The Great Western lead, from which over £100,000 worth of gold has been obtained, has been worked for over 2 miles to a width which exceeds in places 1,200 feet. Ararat: A number of shallow leads trend towards the Hopkins Valley, where they combine into one main lead, which extends southerly beneath the basalt. The borings put down prove that this lead system extends in all probability for at least 8 miles, with a covering of from 230 to 300 feet of basalt. Landsborough: This extends northerly from Barkly, past Landsborough to Navarre, and on towards the Wimmera Valley. The tributary leads at Navarre were very rich; the depth of sinking from 50 to over 100 feet.

Beaufort.—This lead, known as Fiery Creek, has been worked from the head of Fiery Creek, through the town of Beaufort, in an easterly direction, to its junction with the Waterloo lead.

Smythesdale.—Rising in the Hard Hills, the Linton lead trends southerly to its junction with the Standard lead, and beyond that it is called the Happy Valley lead, which, trending rapidly to the east, enters the main Smythesdale lead, which rises near Nintingbool, and trends southward through Piggoreet, Cape Clear, and on to the Pitfield Plains. The Snake Valley lead falls northward from the Hard Hills, and junctions with the Preston Hill lead. It is probable that these two leads will eventually join with the Haddon lead, and the latter junction with the Midas leads. As an instance of the richness of portion of these leads, the Magnum Bonum claim, covering an area of 12 acres, yielded at a depth of 102 feet 6,639 ounces of gold, value £26,556.

Rokewood.—The extension of the Break o'Day lead, already worked through the township of Rokewood, still further south, remains to be proved.

Bet Bet Valley leads.—This extends from Lexton, through to Caralulup, Lillicur, and Bung Bong, to Rathscar, in the Avoca Valley. The course of this lead is unmistakably marked by a strip of basalt, from 1 to 2 miles in width, which follows the valley, and is bounded on the east and west by ledges of outcropping Silurian rock. The course of



DISH WASHING.

the lead goes northward about $3\frac{1}{2}$ miles into Rathscar, where it turns westward, and in about 2 miles further is joined by the Homebush lead. Beyond here it passes into and down the Avoca Valley, where it is joined by the Avoca lead system. It probably extends past Archdale and beyond St. Arnaud.

There is thus an average length of over 40 miles of main trunk lead traversing auriferous rocks fed by rich tributary leads and with numerous rich shallow workings in the bordering country on either side. That portion extending from the southern line of a series of bores put down at boundary of Lexton to the Homebush leads, a distance of 20 miles, deserves special attention, being well defined by borings and being bordered by rich auriferous country.

Amherst and Maryborough Leads.—A series of leads from Amherst, Daisy Hill, Alma, and Maryborough, nearly all trend towards Timor, where the course of the main lead is marked by the deep leads worked by the various Duke companies. The Sadowa lead extends for several miles towards Talbot.

Loddon Valley Lead.—This lead system, with its tributaries, is probably the most important yet worked in the colony, extending from the Midas and Dowling Forest group of mines, a distance of 16 miles of unworked ground; then the marvellous Berry group of mines, with 4 miles of unworked ground. Northerly from the junction of these two lead systems as far as the parallel of Carisbrook, the Mount Greenock, Majorca, and Carisbrook leads come in from the west, and the Loddon leads from the east. The boring near Moolort proved a large and well-defined trunk lead, which extends close to Eddington, where the Bet Bet system probably joins it. In the total length of this system there are 60 miles of unworked leads. Dunolly and Burnt Creek Leads.—Leads trending down the Bet Bet Valley, such as Chinaman's Flat and Four-mile Creek, were very rich.

Daylesford Leads.—These leads are all above the level of the present stream. The most noteworthy are the Wombat Hill lead, Deadman's lead, Italian Hill lead, O'Hara Burke lead, Fern Tree lead, and Jim Crow Creek lead.

Bendigo Leads.—The rich alluvial gullies fed by the Bendigo reefs trend toward Bendigo Creek into a main lead near the White Hills, which has been traced a length of 7 miles. Several tributaries enter below the White Hills from the westward, trending northerly towards Huntly. It is estimated that for a distance of 6 miles from the White Hills the lead yielded £2,000,000 worth of gold. A minor lead system extends north-westerly along the Myers Creek Valley, receiving tributary leads from Eaglehawk on the east. Still further north a lead system extends for several miles past Neilborough.

Heathcote Leads.—McIvor Creek has been worked for a number of leads; most of the gold occurs in nuggets—one of these weighed 658 oz.

Castlemaine Leads.—Extensive gullies have been worked at Chewton, Maldon, Castlemaine, and down through Yandoit to Newstead.

Malmsbury and Coliban Valley Leads.—This system of leads extends from the Main Dividing Range between Trentham and Blackwood. It is fed by various tributaries from Trentham, Lauriston, Taradale, and Malmsbury. A line of bores near Carlsruhe proved deep ground at 348 feet from the surface. Four and a half miles northward, near Lauriston, a lead was proved, and 2 miles further north a third series of bores proved wash at a depth of 371 feet. Near Malmsbury, the Taradale lead junctions with the main lead. Following down the valley of the Coliban, borings at Redesdale proved the bed-rock to be 223 feet from the surface, the fall of the surface from Kyneton to Redesdale being evidently greater than that of the lead. From Trentham to Axedale, on the general course of the lead system, the distance is fully 50 miles, and from near Carlsruhe to a little beyond Redesdale the distance is 25 miles.

Plenty River Leads.—Rising in the Plenty Ranges, where several creeks and gullies have been worked with satisfactory results, notably Jack's Creek and Deep Creek, the lead extends to Whittlesea, while at South Morang a tributary lead had been worked for some years by means of tunnels. Boring is now being carried on to prove the position of the lead, which it is thought might extend still further south towards Collingwood. **Tanjil Leads.**—Here a lead has been traced for several miles along the valley of the Tanjil to a higher level than the present stream. **Neerim Lead.**—A sub-basaltic lead extends for a distance of about 20 miles along the water-shed between the Tarago River and the Latrobe. **Moondarra.**—This lead system extends along the plateau between the Tyers and the Thomson Rivers for a distance of 16 miles.

Rutherglen Leads.—There are two main deep leads now being worked—the Great Southern, which is a continuation of the Chiltern Valley Lead, and the Great Northern. The principal companies now at work include the Great Southern, Southern and Chiltern Valley United, Great Southern No. 1, Prentice United, North Prentice, Great Northern Extended, and the Wahgunyah. The yield of gold for the Chiltern and Rutherglen districts has been £2,282,384.

Ovens River.—The Ovens River and nearly all its tributaries below Porepunkah have proved auriferous. In the higher levels terrace washes, and in the lower there is evidence of a very extensive deep lead system, now being proved near Palmerston by boring. Similarly, from the neighbourhood of Beechworth in the highly auriferous plateaux situate on the water-shed line between the Ovens and the Little or Kiewa runs, a number of lead systems radiate towards the main valleys on either side, as the Eldorado, Woolshed, and Staghorn Flat, and numerous others.

Dargo High Plains.—Round the edge of this basaltic plateau, at an altitude of between 4,000 and 5,000 feet, gold has been found and partially worked for many years. Recently tunnelling operations by Ryan and Co. have disclosed what appears to be a deep lead system extending for a distance of over 20 miles. In the Kiewa Valley there are miles of terraces which should repay mining exploration. Similarly in the Mitta Valley and all its tributaries alluvial deposits and leads occur. Towards the head of the Murray, Buckwong Creek, and Limestone Creek, along the Tambo Valley, terrace washes occur in the Mitchell and all its tributaries, the Wongungarra, Dargo, Wentworth, Crooked River, Wonnangatta River, the Bemm River in East Gippsland, the heads of the Broadbribb, the Mackenzie—in short, the heads of the Yarra, Goulburn, and all streams to the east rising in the Main Dividing Range—contain auriferous deposits, either as creek and gully alluvium or as terraces.

BRIGHT PROSPECTS OF MINING.

Who will dare to venture the assertion that Victoria's alluvial deposits and leads are worked out in the face of such overwhelming evidence to the contrary? When we realize how small a portion of the proved auriferous ground has really been worked as compared with that awaiting development, there can be but one feeling, and that of unbounded confidence in the future mining prospects of the colony. In one square mile of ground in the Madame Berry area gold to the value of £1,586,758 has been raised, £848,700 paid in dividends, £433,000 in wages, and £130,000 in royalty. There is no special reason why other portions of the unworked leads should not yield similar returns. They intersect similar belts of known auriferous territory, and when the location of the known quartz-bearing auriferous belts are mapped out, and also the courses of the leads which intersect them, a new mining era will evolve, and science and practice go hand in hand towards a more rapid industrial progress and continuous prosperity.

On the east side of the Hall will next be visited
THE ARMAMENT COURT.



MODELS OF TORPEDO BOATS.



Uniforms and Accoutrements of various British Regiments.

Model of Armstrong Gun.

Carbines, Enfields, and Martini-Henry Rifles.

Series of Pictures illustrating Scenes in the Crimean War, lent by Hon. L. L. Smith.

Model of Williamstown Rifle Ranges, made by Mr. J. Porter.

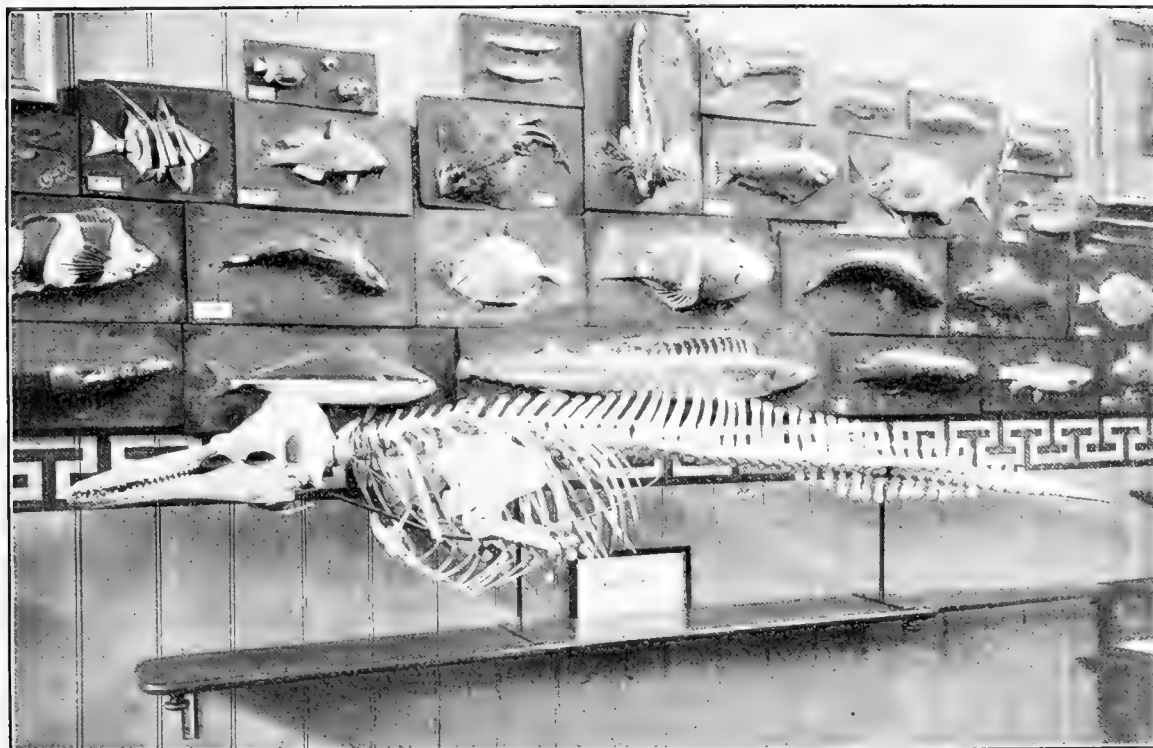
Kynoch's case of Ammunition.

Relics of the Kelly Gang.

Here is also shown the iron armour worn by Steve Hart, who was a member of the famous, or rather infamous, band of outlaws known as the Kelly Gang, which was the terror of the North-eastern District until their final destruction at Glenrowan. For some considerable time this gang held the police and all authority at defiance. They were finally brought to bay by the Police, under Superintendent Hare, after a stubborn resistance. Three members of the gang were killed, and Ned Kelly taken alive and afterwards executed. It was on this occasion that the members of the gang appeared in the armour here exhibited, which were made by a local blacksmith from old mould-boards. The excitement in Melbourne may be judged by the telegrams appearing in the public press headed "Outlaws in Armour." The set of armour here shown was secured for the Trustees through the good offices of the late Mr. T. R. Wilson, the Under Secretary.

Adjoining is

THE FISHERIES COURT.



containing a varied and interesting collection of Exhibits, included amongst which are the following :—

- Large Stuffed Crocodile.
- Large Stuffed Sea Leopard.
- Group Stuffed Seals.
- Skeleton of Porpoise.
- Skeleton of Crocodile.
- Models of Fish.
- Fishing Tackle and Nets.
- Model of Trawling Boat.
- Commercial products of Fishing.
- Glass Models of lower forms of Marine Life.
- Sea-weeds, Sealskin Clothing used by shipwrecked Sailors, presented by Mr. M. L. Kreitmayer, Stuffed King Penguin, Blue Crane, Ibis, Heron, Pelican, Albatross, Models of Chinese Junks, &c.

The Exhibits in the centre of the Hall will next claim the visitor's attention, foremost amongst these is a Wims-hurst Electrical Machine.



A WIMSHURST ELECTRICAL MACHINE.

Electricity is developed in this machine by two circular plates of glass, armed with thin copper plates placed at distances apart, being set in motion and rotated in contrary directions, the electricity is then picked up by brass wire-brushes and passed in sparks from one electrode to the other. Adjoining is another most interesting Exhibit.

THE PLANETARIUM.

This is a contrivance for exhibiting the relative positions and motions of the planets and their satellites.

The Sun is represented by the large brass ball in the central position of the apparatus, and the eight smaller globes held at constant distances from it by means of rods are the planets. The still more minute spheres which are seen in the vicinity of each planet (with the exception of the two nearest to the Sun) are the satellites or moons. These are also held at definite positions from the respective primary by separate systems of rods. It will be seen that the eight principal rods at one end of which the planets are attached are fixed at the other end to a vertical shaft. This shaft passes through the Sun, and is connected to clock-works below ; so that when the clock is started, the shaft turns from left to right, and causes the rods to revolve. Consequently, the planets with their moons are carried uniformly around the Sun from left to right, or in a direction opposite to that in which the hands of a watch appear to move. If now we regard the left-hand side as the west, then all the motions in the apparatus (with two exceptions referred to later) take place from west to east, which is in accordance with what really occurs in the heavens.

While the planets thus revolve around the Sun, carrying the satellites on their long journey, the satellites circulate independently around their respective primaries. This celestial phenomenon is reproduced in the apparatus by separate gearing, which gives an independent movement of revolution to the rods connected with the moons, as obviously seen in the case of our Earth and Moon.

Again, each planet spins round its own axis also from left to right, or from west to east, and this motion is also shown by the apparatus. We see, in fact, that while the Earth goes once round the Sun, it revolves 365 times on its own axis, and in the same period the Moon makes about thirteen revolutions around it.

The period of revolution around the sun corresponds to the year, that of rotation on its axis is the day, and the revolution of the Moon round the Earth gives the lunar month.

The rods which connect the planets with the Sun, and those to which the moons are attached, may be considered in regard to their action as representing the actual forces exerted by the Sun on the planets and by the planets on the satellites, the effect of which is to prevent these heavenly bodies from flying away at a tangent and to compel them to describe closed orbits. The floor of the instrument represents a plane parallel to the ecliptic. Here are shown the signs of the zodiac, the points of the compass, the months of the year, &c. ; and serve to ascertain in what part of the starry heavens the planets appear at any given time of the year.

This is the general outline of what the instrument is meant to indicate. We may now see what the principal dimensions are.

Mercury.—This is the planet nearest to the Sun, its distance from it is 36,000,000 miles, its diameter, 3,000 miles. Goes round the Sun in 88 days. Has no satellites. The time of rotation on its axis is not certain.

Venus.—Distance from Sun, 67,000,000 miles ; diameter, 7,700 miles. Goes round the Sun in 225 days. Its period of rotation around its own axis not quite certain yet.

The Earth.—Distance from Sun, 93,000,000 miles ; diameter, 7,918 miles. Goes round the Sun in a year ; spins round its own axis in 24 hours.

The Moon is the only satellite of the Earth. Its distance from it is 239,000 miles, its diameter, 2,163 miles ; goes round the Earth in a lunar month, viz., $27\frac{1}{4}$ days.

Mars.—Distance from the Sun, 141,000,000 miles ; diameter, 4,200 miles. Goes round the Sun in 687 days ; spins on its own axis once in 24h. 37m. 23s. Has two satellites, discovered by Professor Hall in 1877—the outer called Deimos, and the inner called Phobos. The distance of Deimos from Mars is 14,600 miles, and that of Phobos 5,800 miles. Deimos goes round Mars in 30h. 18m., and Phobos in 7h. 39m.

Jupiter is the largest of all planets. Its distance from the Sun is 483,000,000 miles, its diameter, 86,500 miles. Goes round the Sun in nearly twelve years ; spins round its own axis in 9h. 55m. Jupiter has five satellites, usually distinguished by the numerals 1, 2, 3, &c. The first four were discovered by Galileo, in the year 1610, and although the planet had been continuously observed in every country since that time, the fifth satellite was only discovered recently at the Lick Observatory, by Professor Barnard.

For the diameters of the satellites, their distances from Jupiter, and their periods of revolution around it, we have—

| No. of Satellite. | Distance of the Satellite from Jupiter, in miles. | Diameter, in miles. | Period of Revolution around Jupiter, in days, hours, and minutes. | | | Names by which these Satellites have on some occasions been called. |
|-------------------|---|---------------------|---|----|----|---|
| | | | d. | h. | m. | |
| I. | 261,000 | 2,400 | 1 | 18 | 27 | Io. |
| II. | 415,000 | 2,200 | 3 | 13 | 42 | Europa. |
| III. | 664,000 | 3,600 | 7 | 3 | 42 | Ganymede. |
| IV. | 1,167,000 | 3,000 | 16 | 16 | 32 | Calypso. |
| V. | — | — | — | — | — | — |

Saturn is a wonderful object on account of the ring system surrounding its globe. Distance from the Sun, 886,000,000 miles ; diameter, 71,000 miles ; goes round the Sun in $29\frac{1}{2}$ years ; spins round its own axis in $10\frac{1}{4}$ hours.

Saturn has eight satellites, the particulars of which are given in the following table :—

| Name. | Distance from Saturn, in miles. | Diameter, in miles. | Period of Revolution. | | | Discoverer. |
|------------------|---------------------------------|---------------------|-----------------------|----|----|-----------------------------|
| | | | d. | h. | m. | |
| Minas | 117,000 | 600 | 0 | 22 | 37 | Sir William Herschel, 1789. |
| Enceladus | 157,000 | 800 | 1 | 8 | 53 | Same. |
| Tethys | 186,000 | 1,100 | 1 | 21 | 18 | J. D. Cassini, 1684. |
| Dione | 238,000 | 1,200 | 2 | 17 | 41 | Same. |
| Rhea | 232,000 | 1,500 | 4 | 12 | 25 | Same. |
| Titan | 771,000 | 3,500 | 13 | 22 | 41 | Huyghens, 1655. |
| Hyperion | 934,000 | 500 | 21 | 6 | 39 | G. P. Bond, 1848. |
| Japetus | 2,225,000 | 2,000 | 79 | 7 | 54 | J. D. Cassini, 1671. |

Uranus.—Discovered by Sir William Herschel in 1781. Distance from the Sun, 1,782,000,000 miles ; diameter, 32,000 miles ; goes round the Sun in 84 years ; axial rotation not known.

Uranus has four satellites, which, unlike the other systems, move around the planet from right to left, viz., from E. to W. :—

| Name of Satellite. | Distance from Uranus, Miles. | Diameter, in miles. | Period of Revolution around Uranus. | | | Discoverer. |
|--------------------|------------------------------|---------------------|-------------------------------------|----|----|---------------------------|
| | | | d. | h. | m. | |
| Ariel | 120,000 | 500 | 2 | 12 | 29 | Lassell, in 1851. |
| Umbriel | 167,000 | 400 | 4 | 3 | 27 | Lassell, in 1851. |
| Titania | 273,000 | 1,000 | 8 | 16 | 56 | Sir W. Herschel, in 1787. |
| Oberon | 365,000 | 800 | 13 | 11 | 7 | Sir W. Herschel, in 1787. |

Neptune.—Discovered by Le Verrier in 1846. Distance from the Sun, 2,792,000,000 miles; diameter, 34,800 miles; goes round the Sun in 164 years; velocity, miles per second in the orbit, 3·4.

Neptune has one satellite, discovered by Lassell, at Malta, in 1846. This also moves from right to left or from E. to W. Distance from planet, 225,000 miles; time of revolution, 5d. 21h. 3m.; diameter, 2,000 miles.

The actual velocity at which the various planets move in going round the Sun are as follows, given in miles per second of time.

Mercury, from 23 to 35 miles a second; *Venus*, 22 miles; *Earth*, 18½ miles; *Mars*, 15 miles; *Jupiter*, 8 miles; *Saturn*, 6 miles; *Uranus*, 4¼ miles; *Neptune*, 3½ miles.

Relative sizes of the planet and of the Sun.—Supposing the Earth to be a small globe 1 inch in diameter, then the other planets should have the following diameters, in order to be in proper proportions, viz.:—*Mercury*, ⅓ of an inch; *Venus*, 1 inch; *The Earth*, 1 inch; *Mars*, ½ inch; *Jupiter*, 11 inches; *Saturn*, 9 inches; *Uranus*, 4 inches; *Neptune*, 4½ inches. The Sun should be 109 inches, and the Moon only ¼ inch.

P. BARACCHI, 16/6/96.

Model of Sunday School.

Model showing Harbor Trust improvements in the River Yarra, from the Falls-bridge to the west end of New Channel.

Model of Central Passenger Station at Flinders-street, as proposed by the late Hon. John Woods in 1879.

Model of the Melbourne Station, showing improvements being carried out by the late Hon. John Woods in 1879.

Model of the Quarantine Station.

Models of Boat Screws.

BLACK HORSE SALT EXHIBIT.

Henry Berry and Co., Agents.

About 50 years ago that well-known and enterprising member of the English House of Commons, Mr. John Corbett, purchased the large estate at Stoke Prior, upon which are the celebrated Worcestershire Rock Salt Mines.

Although these mines had been worked to some small extent for at least 1,000 years, but little was known of the real character and excellence of the beds of salt, lying at such an immense depth below the surface. However, through the energy of Mr. Corbett these mines have been fully developed, and found to contain millions of tons of pure glass-like chloride of sodium (pure salt in white crystal formations), free from the red oxide and many earthy impurities contained in the Cheshire Rock Salt. Hence no chemical or colouring matter of any sort is required or used at this factory, any of which substances are more or less prejudicial to the successful curing of meat and provisions generally. The buildings and plant of this factory, covering an area of 30 acres, have been erected at a cost of not less than £530,000, no expense being spared in machinery and improvements for the production of the finest Stoved and best Curing Salt, which is now deservedly classed as the purest the world produces.

These mines were worked by the Romans, and as the pay of a Roman soldier was in salt it is said that the word salary was in this way derived.

Model of Sydney Harbor.

Case of Torpedo Boat Models, by Messrs. Thornycroft and Co.

Models in Wax of Flowers and Fruit.

Case showing the whole process of Wax Vesta Manufacture, by Messrs. Bryant and May (Messrs. James Service and Co., agents).

Case showing the whole process of Cotton Manufacture, Messrs. R. Howarth and Co.

PRODUCTS OF EUCALYPTUS.

Prepared by the late J. Bosisto, Esq., C.M.G., M.P., Pharmaceutical Chemist, Melbourne.

Essential Oils and Resins—

Bluegum.—Essential Oil of Eucalytus (*Eucalyptus globulus*). Therapeutic uses—For internal and external uses, and sanitary purposes.

Peppermint Gum.—Essential Oil of Eucalyptus (*Eucalyptus amygdalina*). Therapeutic uses—External and sanitary. (Yields Phyllandren.)

Mallee Gum.—Essential Oil of Eucalyptus (*Eucalyptus dumosa*). Therapeutic uses—Various. Produces Eucalyptol in great abundance.

The most valuable product in the series is undoubtedly the oil of Eucalyptus, prepared from the leaves of the “Mallee” or *Eucalyptus dumosa*, a stunted species of Eucalypt, especially favouring the district of the north. Mr. Bosisto devoted the best part of a long life to the study of the question of how to extract this valuable product in a perfectly pure state, and he so far succeeded that the result of his efforts is recognised by chemists as the standard oil of commerce. His investigations commenced in 1853, and have been published from time to time.

Essential Oil of *Menthae Gravis* (an indigenous Mint).

Melaleuca Ericifoliae Ess. (Oil in the Ti-ti tree).

Oil of Spearmint (*Menthae viridis*).

Oil of the Leaves of the Native Sassafras (*Anthosperm. mosch.*).

Eucalyptus Balsam. (Employed for Veterinary purposes.)

Ol. *Eucalypti Stuartianae* Ess. (Apple-tree gum).

Ol. *Eucalypti Fabrorum* Ess., or Stringy-bark.

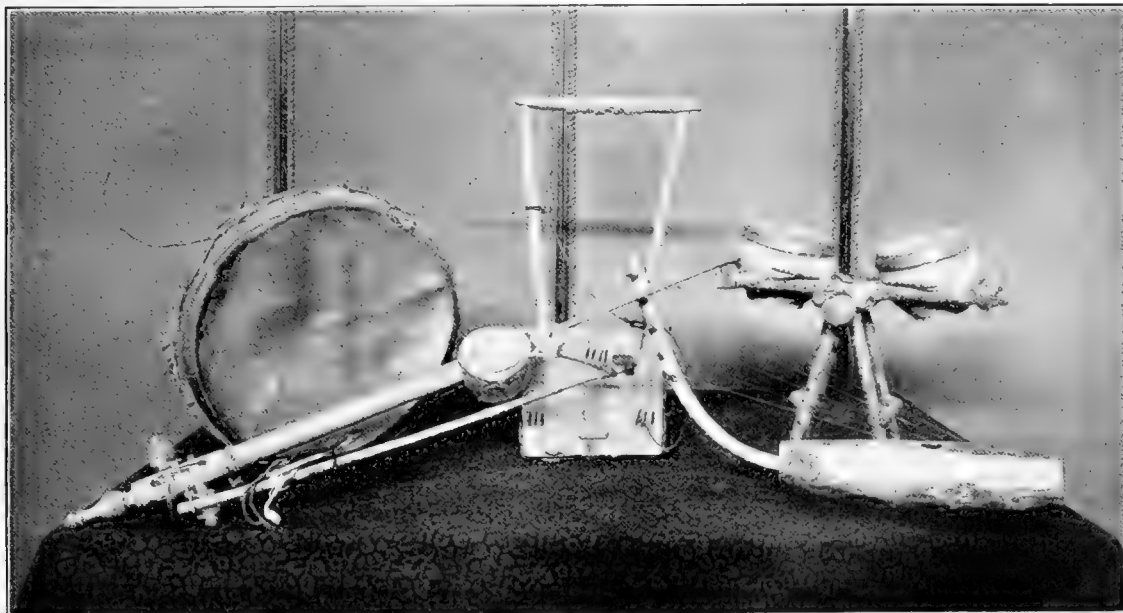
Eucalyptus Oil—standard test. (Supplied throughout the world as the recognised medical product.)

Essential Oil of *Eucalyptus* (*Percifoliae*).

Melaleuca Genistifoliae Ess.

The True Oil of Peppermint (*Menthae Piperitæ* Essent.). Grown in Victoria.

Esprit Wattle Blossom.



COLLECTION OF NUBIAN MUSICAL INSTRUMENTS.

COLLECTION OF AUSTRALIAN SNAKES.

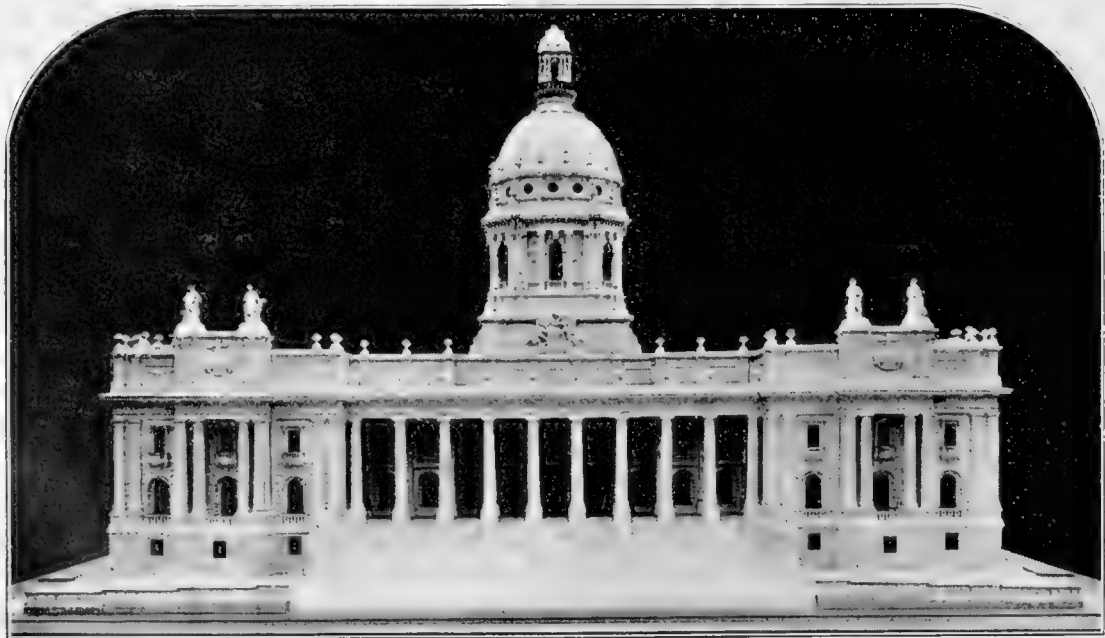
(Prepared for Purpose of Instruction by Mr. C. French, F.L.S.)

The practical and most important study of Ophiology is one, amongst many others, which has been neglected in Victoria, and popular works based on the excellent remarks by Dr. Günther, of the British Museum, and in a smaller but practical manner by the late Gerard Krefft, of the Sydney Museum, seem to be sadly in request. Those who live in the bush are often perplexed by the local names used; for instance, the true Carpet Snake of the Murray border is known to be quite harmless, while the so-called Carpet Snake of Westernport, Gippsland, &c., is no other than *Hoplocephalus curtus*, our Tiger Snake, one of the most deadly species in Australia; and these remarks apply to many other kinds. It is with a view of familiarizing the public in this most important respect that the Trustees have resolved to form a general collection (as complete as possible) of all known Australian Snakes, with scientific and common names, and localities added; also short remarks as to their food, from authentic sources. In this way much information may be gained, which plates, however correct, would fail to convey. In a framed tablet near the case will be given practical instructions *re* treatment of persons suffering from snake-bite, also some useful remarks as to the structure and position of the fangs, poison glands, &c., &c.

THE CONCHOLOGICAL COLLECTION.

This extensive and interesting collection is classified and scientifically named on the same principle as adopted in the Melbourne University Museum.

Leaving this portion of the Annexe, one next visits the Machinery and Manufactures Hall. The first object to attract attention is



A MODEL OF PARLIAMENT HOUSE, MELBOURNE.

as it will be when completed, presented by the Hon. T. Bent, when Speaker of the Assembly.

To the right will be seen the following Exhibits :—

DENTON MILLS HAT FACTORY COMPANY LIMITED.

This Exhibit is to show the various stages of Hat Manufacturing from the raw material (that is, the greasy wool just as it comes from the sheep, and the rabbit skin just as it comes from the rabbit) right up to the finished article ready to be worn.

FLAX EXHIBIT.

This Exhibit has been presented to the Trustees by Mr. J. J. Wilson, 70 Queen-street. In it Flax is seen in all its stages, from the small bright seed to the soft silky fibre fit for the manufacture of textile fabrics. Some of these samples are very pretty. There are also photographic views of a rippling machine for threshing the seed, and of two other mechanical appliances known as a Treoker and a Scutcher respectively. The two last-named machines are employed to separate the fibrous material ("line") from the woody portion of the Flax plant. At a time when the Flax industry is claiming attention in the colony, this Exhibit forms a useful object-lesson to intending growers and others.

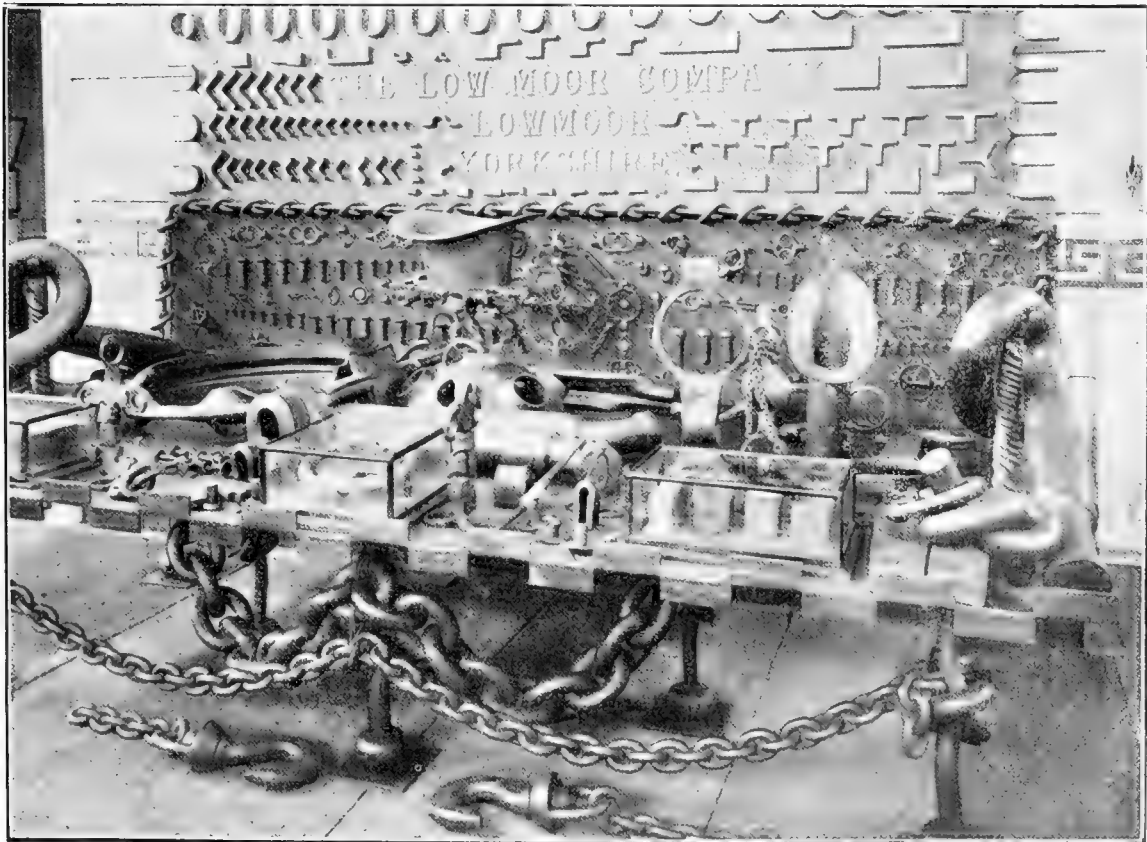
J. Miller and Co.—Rope and Cordage.

Arthur Tilley.—Soaps and Perfumes.

Consett Iron Exhibit.

Iron Exhibit presented by the Earl of Dudley, Pernam.

Lowmoor Company's Iron Exhibit.



LOWMOOR IRON EXHIBIT.

Norwegian Sully.
 Vickers and Son.—Steel Crank, bent cold.
 J. J. Cordes and Co.—Steel Nails, &c.
 T. Ironmonger and Sons.—Cordage Exhibit.
 H. W. Perriam.—Nails and Bolts.
 Eglinton Foundry and Forge Exhibit.
 The Schott's Iron Co. Exhibit.
 Henry Disston and Sons, U.S.A.—Saws, &c.
 L. Mannstaldt and Co.—Ornamental Iron work.
 Model Viaduct of Pompadour.
 Two stands Photographs of French engineering works.
 James Fry and Co.—Two cases samples of Wheat and Manures.
 Model showing Safety-catch for Gate.
 The Australian Gum Arabic Co.—Vegetable Oils.
 Dookie Agricultural College.—Exhibit illustrative of Olive Oil manufacture.
 Gold Trophy, presented by C. A. Topp, Esq.
 Newbould and Co.—Exhibit of Saws and Tools.
 Model of "Normanhurst," residence of Lord Brassey.
 Models of Yachts, lent by H. R. Murray.
 Models of Bridges.
 Sands and McDougall.—Specimens of Electrotpe work.
 Photographs of New Guinea, by J. W. Lindt, lent by Monsignor O'Hea.
 Adelaide Sewage Exhibit.
 Lewis and Whitty.

The Exhibit includes laundry requisites in the shape of square Blue, Rice Starch, and Washing Powders ; household requisites, such as Blacking, Knife Polish, Blacklead, Baking and Egg Powders, Black Boot Glosses, Tan Boot Glosses, and Culinary Essences ; also Refined Mineral Oils and Dry Lubricants for lubricating every description of machinery ; Hatters' Dyes and Felt Colours of various shades. Established 28 years.

Through pressure of space in the Ethnological Court it has been necessary to place in proximity here—

Large Canoe, made by the natives of the Northern Territory by hollowing out a tree trunk.
 Japanese Bark Canoe, presented by Mr. E. E. Shaw, per favour of Mr. G. R. Fincham.

ST. PETER'S, ROME.

The foundation stone of St. Peter's, in Rome, was laid on the 15th April, 1506, in the presence of 35 cardinals. The ceremony of consecration was performed by Pope Urban VIII. on November, 1626, the 1,300th anniversary of the day on which St. Sylvester is stated to have consecrated the original edifice. By the end of the seventeenth century the cost of building the cathedral had amounted to upwards of £9,400,000, and the present cost of maintenance amounts to about £7,500 per annum. The new sacristy, erected by Pius V., cost about £180,000. The result is that St. Peter's is the largest and most imposing, if not the most beautiful, church in the world. Its area is about 18,000 square yards. The facade is 123 yards long and 165 feet high. It is surmounted by a balustrade, with statues 19 feet high of several of the Popes ; the inscription records that it was erected by Paul V., in 1612. The portico, the ceiling of which is magnificently decorated, is 78 yards in length, $14\frac{1}{2}$ yards in width, and 66 feet in height. The interior of the cathedral is strikingly impressive, and this effect is produced not so much by the vastness as by the harmony and symmetry of its proportions. The magnificent and plainly decorated dome rests on four huge buttresses 234 feet in circumference, the niches in which are occupied by statues 16 feet high. Above them are the four loggie of Bernini, in which the greatest relics are exhibited on high festivals, on which occasion the loggie may be entered by none but the canons of St.

Peter's. The height from the ground to the top of the cross is 470 feet. The dome is 630 feet in circumference. A narrow iron staircase leads to the lantern, which commands a view of the whole



MODEL OF ST. PETER'S, ROME.

of Rome and its surroundings. In order to institute a comparison, it may be stated that the dome of St. Peter's is over 100 feet higher, from datum level, than that of the Melbourne Exhibition Building.

The area of the church is 212,321 square feet. The areas of other great churches are here given for comparison :—

| | | | | Square feet. |
|--------------------|-----|-----|-----|--------------|
| St. Paul's, London | ... | ... | ... | 108,982 |
| Milan | ... | ... | ... | 107,782 |
| Seville | ... | ... | ... | 100,000 |
| Cologne | ... | ... | ... | 81,464 |
| York | ... | ... | ... | 72,860 |
| Amiens | ... | ... | ... | 71,208 |
| Lincoln | ... | ... | ... | 66,900 |

The number of columns, including those in the colomnade, is 756, the greater part of which were taken from the buildings of ancient Rome.

Adjoining is a handsome case belonging to Messrs. Swallow and Ariell.

Nearly adjoining will be seen a case shown by Messrs. Jas. F. McKenzie and Co., Flinders-street, containing a handsome and interesting exhibit of their chief manufactures :—Coffees, Cocoas, Mustard, Spices, Peppers, Oatmeal, Curry Powder, Baking Powder, &c., &c.

An instructive feature is a series of samples representing the process of the conversion of Oats into Oatmeal, Flaked Oatmeal; Groats; of Barley into Pearl Barley, Flaked Barley, and Patent Barley; of the undressed Rice, as imported, into the beautiful white grains known to the consumers.

The various descriptions of Coffee are shown from which McKenzie's favorite brands are prepared, as well as their "Perfection" Essence of Coffee and Chicory. The varieties of Cocoa Beans evidence the careful selection made for the manufacture of Cocos, and especially McKenzie's Essence (or Extract) of Cocoa, which is so deservedly popular.

Numerous Exhibition Medals and Awards have been obtained in many parts of the world by this firm.



SEWAGE EXHIBIT.

In close proximity will be seen

PHOTOGRAPHIC VIEWS

presented by the Municipalities :—

Collection of views of the Boroughs of Brunswick, Clunes, Colac, Echuca, Hamilton, Portland, and Sale, the City of Prahran, and the Shire of Metcalfe.

Collection of Tasmanian views presented to the Trustees by the Tasmanian Tourist Association, per favour of Mr. A. Morton.

PHOTOGRAPHS OF PRIZE CATTLE

presented to the Trustees :—

The property of Messrs. Robertson Bros., Colac—
Matilda Tenth and Grand Duchess of Derrimut.

Bulls—

Young Student.
Duke of Alva.
Duke of Colac.

Cows—

Lady Rockingham.
Letitia Third.
Roan Duchess.
Lady Rockingham.
Triple Butterfly and Calf.
Fanny.
Third Duchess of Derrimut.
Graceful.



MANUFACTURES COURT.

The property of R. McDougall, Esq., Essendon—

Bulls—

Grand Prince.
Grand Master.
Imperial Purple.
Ajax Booth.

The property of Henry Stevenson, Esq., "Niddrie," Essendon—

Not named.

PRIZE RAMS.

The Hon. Phillip Russell, M.L.C., Carngham—

Nugget Third.
Melbourne Second.

ECONOMIC VETERINARY COLLECTION* OF DRAWINGS.

The property of the Trustees, illustrating the diseases of the various organs of domestic cattle.

- No. 1.—External surface of lung, showing the effusion on the pleural surface in pleuro-pneumonia.
- No. 2.—Portion of lung showing the appearance in the pleuro-pneumonia of cattle.
- No. 3.—Portion of lung from a cow dead of pleuro-pneumonia.
- No. 4.—The spleen incised in splenic fever.
- No. 5.—The heart in splenic fever.
- No. 6.—The kidney in splenic fever.
- No. 7.—Illustrating the condition of the peritoneal surface of the uterus in splenic fever.

After visiting the

CYCLORAMA OF MELBOURNE IN 1842,

which opens from this Hall, and having inspected the

TIMBER COLLECTION,

the visitor returns through the machinery-room of the Aquarium, and will give a passing glance at the



BUSH SCENE.

This tableau tells the silent story so often enacted in the early gold-digging days of the prospector who has gone out into the wilds, making friends with the blacks, and is at last rewarded by, let us hope, good luck. The artist has seized the moment when the digger has panned out and finds a nugget in his dish. In the distance evidently a strange black and his lubra are seen approaching, and are seemingly astonished to find a stranger at home in their haunts.

Traversing the Aquarium a shady nook can be found in



THE FERNERY.

THE FERNERY.

and a welcome rest enjoyed should the weather be propitious. A further peregrination will take the sight-seer to the

MAIN HALL,

which is 500 feet long and 160 feet wide, with galleries and large cellars.

The western end has been partitioned off to form a concert hall, and here is found—

THE EXHIBITION ORGAN,

manufactured by Mr. G. Fincham, of Richmond, for the 1880-81 Exhibition, at a cost of £5,560 9s., and sloping down from it to the ground there is a gallery, containing seats for from 700 to 800 adult choristers, but upon which 1,000 children have frequently been seated. Viewed from the nave the organ presents a most imposing appearance, and the decoration of the front is extremely rich and graceful. It fills up a frontage of 63 feet by a height of 45 feet from the floor on which it stands. In the basement of the building is fixed the gas-engine which works the feeders or bellows from a minimum of 4-inch pressure to a maximum of 10 inches. These feeders supply great reservoirs, from which great wind trunks convey the necessary supplies to other reservoirs within the body of the instrument, and from these different channels the sound-boards are fed with air of the required pressure and equable current, free from pulsation or other fluctuation.



THE MAIN HALL.

On the left hand the staircases lead to the Galleries and thence to the Dome.

VIEW FROM THE DOME.

To a stranger the view from the Dome must be one of the sights of Melbourne, as from this position a splendid panorama meets the view on all sides.

Looking down into the gardens, the flower-beds, which are laid out in panels, have the effect of a beautiful carpet.

From this height the visitor may form an accurate idea of the extent and general arrangement of the city, whilst all the principal buildings are distinguishable. The Parliament Houses, Government Offices, St. Patrick's Cathedral, Government House, the spires of the Independent and Scots Churches, the Town Hall, the new Post-office Tower, and the dome of the Law Courts are the principal objects standing out from the plainer warehouses and other buildings of the city. On a clear day, a view of the blue water of Hobson's Bay and the shipping may be obtained.

On the left hand may be seen the suburbs of Hawthorn, Kew, Richmond, South Yarra, St. Kilda, &c., extending round to West Melbourne on the right hand, encompassing the city proper, which lies directly in front.

Ascending to another platform, about 20 feet higher, an extensive view on all sides is obtained.

The Dome is—

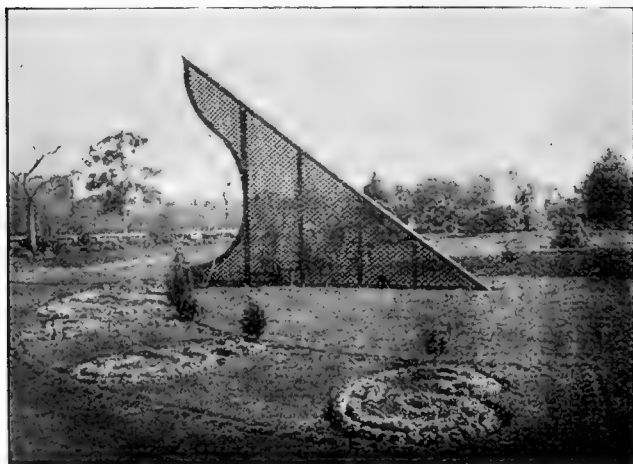
| | | | |
|---------------|-----|-----|--------------------------|
| Latitude ... | ... | ... | 37° 48' 29" south, |
| Longitude ... | ... | ... | 9h. 39m. 52.3s. east, or |
| | | | 144° 58' 0.075" east. |

The height of the Dome is 200 feet ; to the top of the lantern is another 20 feet.

After descending, a pleasant walk may be taken in front of the main building, where there is a plentiful supply of garden seats placed in shady positions, and towards the western end of the front terrace will be found

THE SUN DIAL.

The Dial is a semi-circular border, 6 feet wide and about 30 feet radius, with the hours of the day indicated by figures made and arranged with flowers of various colours, thus forming at the same time an ornamental flower beds



The stile or gnomon points to the South Pole, making an angle of 37° 51' with the horizon. It is 30 feet 9 inches in length, and is supported at the proper inclination by a wooden structure or lattice work, which, notwithstanding the unusually great size, has a pleasing appearance.

The time as indicated by the end of the shadow cast by the stile on the border is "apparent solar time," which is always behind the Victorian zone or statute time by a variable amount ranging from 4 to 35 minutes, according to the seasons, as follows :—

On 1st January the Dial is about 23½ minutes slow on zone time ; then the error increases gradually till 14th February,

on which date it reaches its maximum, viz., 35 minutes slow ; then it decreases gradually till the 15th May, when the Dial is 16 minutes slow ; then increasing again till the 1st August, to an error of 26 minutes ; then decreasing to the minimum error of 4 minutes slow, which value is reached on the 1st of November ; from thence it increases to $23\frac{1}{2}$ minutes on 1st January and so on as before.



FOUNTAIN IN FRONT OF MAIN BUILDING.

THE SPORTS GROUND

takes a prominent place in the internal economy of the Exhibition Building. Here are held many of the galas and monster demonstrations, when all Melbourne turns out of doors for amusement and recreation. The bicycle track is five laps to the mile, and some world's records have been put up here. Seating accommodation has been erected around the sides for about 4,000 spectators, and the grand stand will comfortably hold 1,200, whilst 9,000 or 10,000 more can see all going on inside the ring fence. Behind the grand stand will be found nice sheltered nooks, and an ornamental verandah has lately been erected connecting the main building and the western annexe.

SMITHSONIAN INSTITUTION LIBRARY



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